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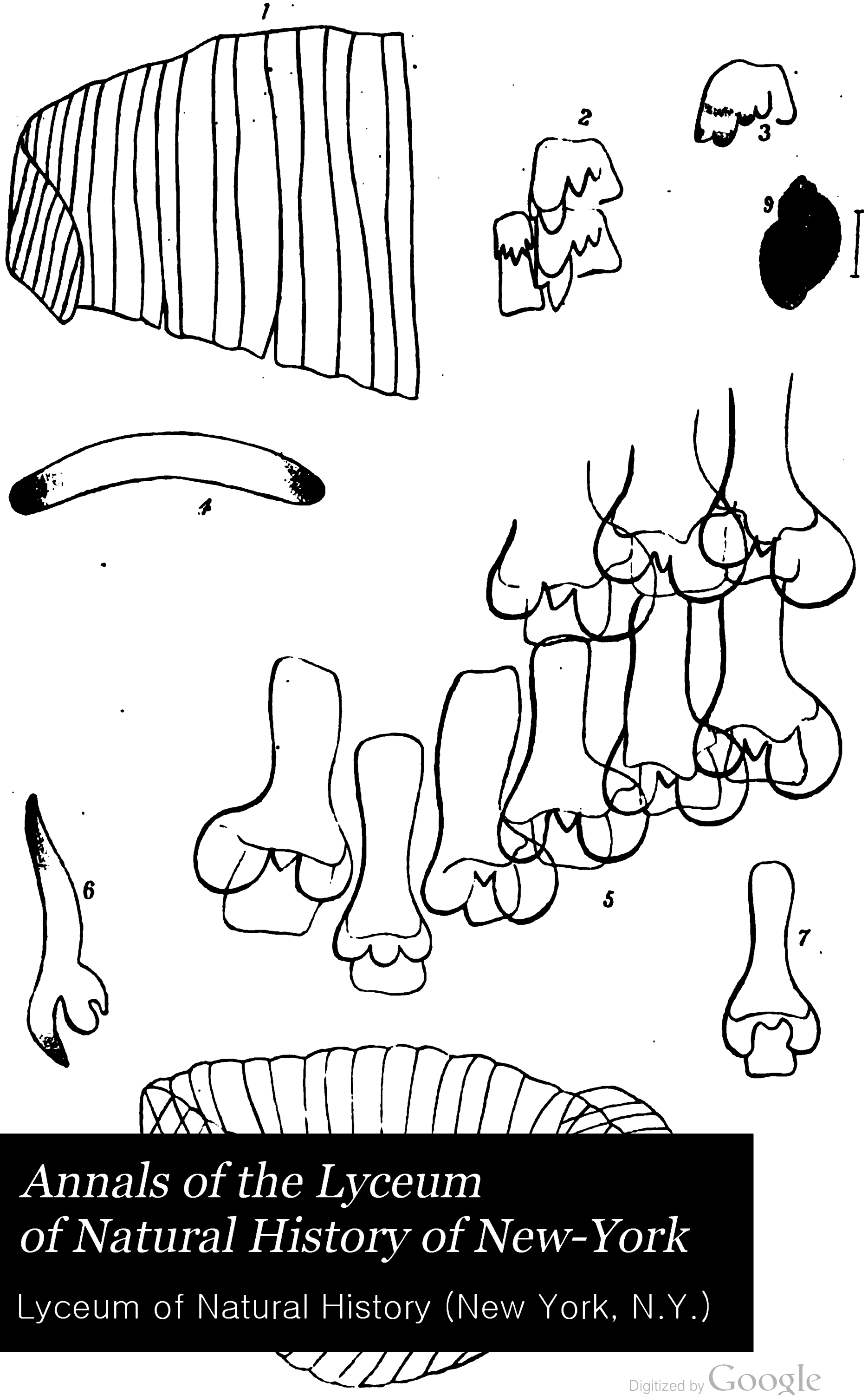

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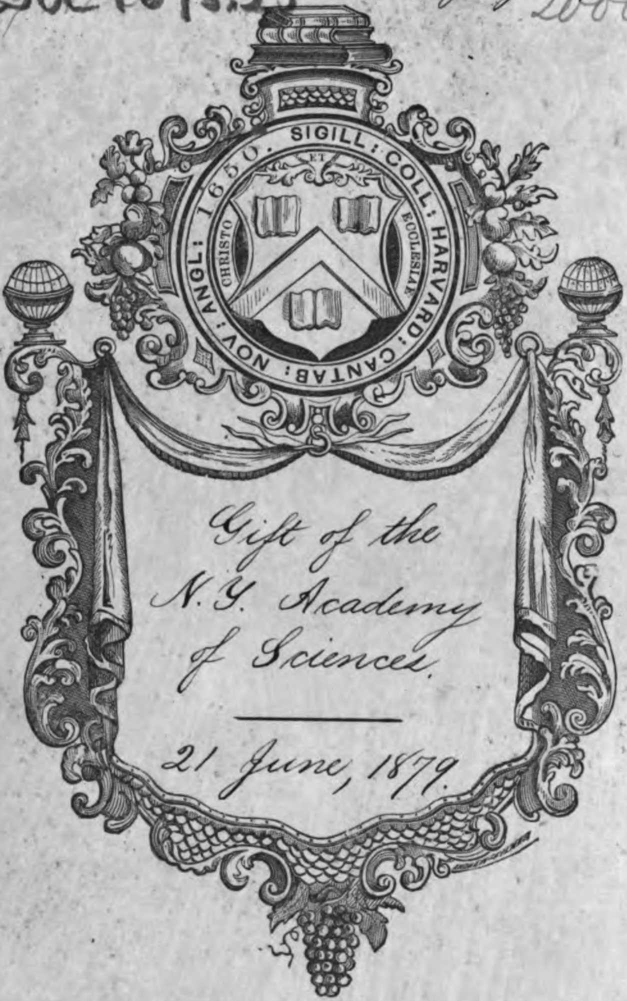

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CONTENTS

OF THE

TENTH VOLUME.

BY THOMAS BLAND AND W. G. BINNEY.

Page.
Notes on the Genus Pineria and on the Lingual Dentition of *Pineria Viequensis*, Pfr. ... 22
On the Lingual Dentition of Helix turbiniformis, Pfr., and other species of Terrestrial Mollusca. (Plate II.) ... 79
On the Systematic Arrangement of North American Terrestrial Mollusks ... 158
On the Relations of Certain Genera of Terrestrial Mollusca of, or related to, the Sub-family Succininæ, with Notes on the Lingual Dentition of *Succinea appendiculata*, Pfr. (Plate IX, in part.) ... 198
Description of Hemphillia, a new Genus of Terrestrial Mollusks. (Plate IX.) ... 208
On the Lingual Dentition of Certain Terrestrial Pulmonata Foreign to the United States ... 219
On the Lingual Dentition of Gæotis. (With plate XI in part.) ... 252
Note on a curious form of Lingual Dentition in Physa. (With plate XI.) ... 255
On Prophysaon, a new Pulmonate Mollusk, on Ariolimax, on Helix lychnuchus and other species. (With Plates XIII and XIV.) ... 293
On the Lingual Dentition and Anatomy of Achatinella and other Pulmonata. (With Plates XV and XVI.) ... 331

BY THOMAS BLAND.

Description of a New Species of Mollusk of the Genus Helicina ... 186
On the Physical Geography of, and the distribution of the Terrestrial Mollusca in, the Bahama Islands ... 311
Description of a new species of Helix, and note on Helix Mobiliana, Lea ... 361

BY H. CARRINGTON BOLTON.

Outlines of a Bibliography of the History of Chemistry ... 352

BY LOUIS ELSBERG.

On the Subdivisions of Science and their Classification ... 277

BY P. FISCHER.

Note sur l' Anatomie des Cyrènes Americaines. (Plate VIII.) ... 191

BY W. J. HAYES.

Description of a Species of Cervus. (Plate X.) ... 218

BY GEORGE N. LAWRENCE.

Descriptions of New Species of Birds from Mexico, Central America and South America; with a Note on *Rallus longirostris* ... 1

Page.
Descriptions of three New Species of American Birds, with a Note on *Eugenes spectabilis*........ 137
Descriptions of New Species of Birds of the Genera Icterus and Synallaxis...... 184
Descriptions of Six Supposed New Species of American Birds........ 395

BY ALBERT LEEDS.

Spectroscopic Examination of Silicates........ 324

BY PROFESSOR BENJAMIN N. MARTIN.

Essay upon a Necessary Limitation of the Doctrine of the Unity of the General Forces of Nature........ 211

BY EDWARD S. MORSE.

On the Tarsus and Carpus of Birds. (With Plates IV and V.)........ 141

BY A. S. PACKARD, JR.

Catalogue of the Pyralidæ of California, with descriptions of new Californian Pterophoridæ........ 257
Notes on some Pyralidæ from New England, with Remarks on the Labrador Species of this Family........ 267

BY FELIPE POEY.

Genres des Poissons de la Faune de Cuba, appartenant à la Famille Percidæ, avec une Note d' introduction par J. Carson Brevoort. (Plate I.)........ 27
Monographie des Poissons de Cuba compris dans la sous-famille des Sparini. (With Plates VI and VII.)........ 170

BY TEMPLE PRIME.

Notes on Specimens of Corbiculadæ in the Cabinet of the Jardin des Plantes at Paris, and on the authorship of the Encyclopédie Méthodique........ 188

BY ROBERT RIDGWAY.

Catalogue of the Birds ascertained to occur in Illinois........ 364

BY JNO. J. STEVENSON.

The Upper Coal Measures West of the Alleghany Mountains. (Plate XII.)...... 226
Notes on the Coals of the Kanawha Valley, West Virginia........ 271

BY WILLIAM STIMPSON.

Notes on North American Crustacea, in the Museum of the Smithsonian Institution. (No. III.)........ 92

BY THEO. A. TELLKAMPF.

Notes on the Ascidea Manhattensis, DeKay, and on the Mammaria Manhattensis. (Plate III.)........ 83

LIST OF PLATES, VOL. X.

PLATE I. *Gramma Loreto, Hypoplectrus maculiferus.*
PLATE II. Figs. 1 and 5. *Bulimulus laticinctus.*
" 2. *Helix turbiniformis.*
" 3 and 4. *Bulimulus Bahamensis.*
For explanations see page 82.
PLATE III. *Molgula Manhattensis.*
For explanations see page 91.
PLATE IV. *Tarsus and Embryos of Birds.*
PLATE V. *Carpus of Birds.*
For explanations see pages 156–158.
PLATE VI. *Calamus Bajonado.*
Calamus orbitarius.
PLATE VII. *Calamus macrops.*
Grammateus medius.
PLATE VIII. Figs. 1–4. *Cyrena Carolinensis.*
" 5–6. " *Floridana.*
For explanations see page 197.
PLATE IX. Figs. 1, 15–17. *Hemphillia glandulosa.*
" 2, 6, 9–11. *Succinea appendiculata.*
" 4, 5. *Pellicula depressa.*
" 7, 8. *Simpulopsis sulculosa.*
" 12–14. *Pellicula convexa.*
For explanations see page 210.
PLATE X. *Cervus Yucatanensis.*
PLATE XI. Fig. 1, 5–7. *Gæotis.*
" 2–4, 9. *Physa.*
" 8. *Amphibulima patula.*
For explanations see page 256.
PLATE XII. Map to show limits of the Upper Coal Measures in Ohio.
PLATE XIII. Fig. 1. *Ariolimax niger.*
" 2–8. *Prophysaon Hemphilli.*
PLATE XIV. Figs. 1, 2. *Helix Columbiana.*
" 3, 4. *Helix germana.*
" 5–8. *Helix lychnuchus.*
For explanations see page 310.
PLATE XV. Fig. 1. *Zonites Gundlachi.*
" 2, 4, 5. *Achatinella producta.*
" 3. *Nanina Chamissoi.*
" 6. *Newcombia picta.*
" 7, 9–11. *Laminella Mastersi.*
" 8. *Leptachatina nitida.*
PLATE XVI. Figs. 1–2. *Helix picta.*
" 3–5. *Onchidium Schrammi.*
For explanations see page 351.

ERRATA.

Page 83, between 2d and 3d line from top, insert "with PLATE III."

Page 85, 7th line from bottom, after "ciliæ on the inside" substitute a semicolon for the comma; same page and line, for "canal" read "canals."

Page 90, 5th line from bottom, for "vermicem," read "vermium."

Page 169, 10th line from bottom, for "*cabias*," read "*calias*;" same page, 6th line from bottom, for "jaws," read "jaw is."

Page 185, 6th line from top, for "Tuchitan," read "Juchitan."

Page 325, 5th line from bottom, for "could," read "can."

Page 328, top line, for "oligoclase-felsite," read "albite."

Page 382, between 2d and 3d line from bottom, insert "Genus *Ortyx*."

Page 395, 18th line from top, for "species," read "specimens."

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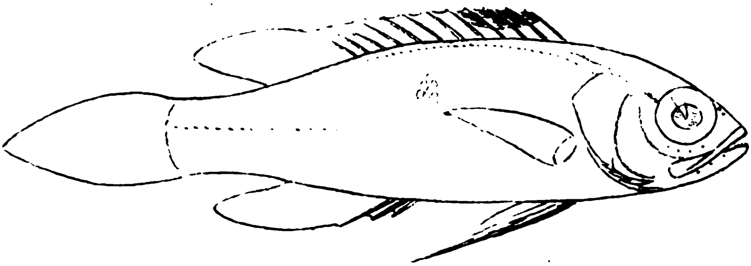

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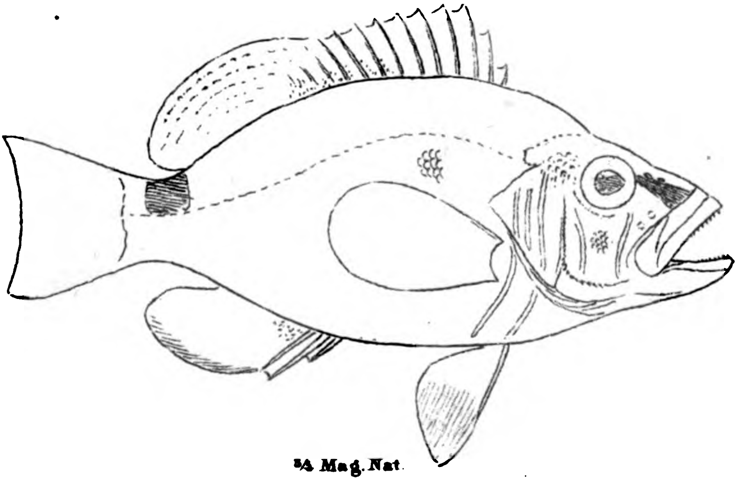

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I.—*Descriptions of New Species of Birds from Mexico, Central America, and South America, with a Note on Rallus longirostris.*

BY GEO. N. LAWRENCE.

Read January 30th, 1871.

SOME of the birds described in this paper were obtained by the late Col. A. J. Grayson, of Mazatlan, most of them on the Island of Socorro, off the Pacific coast of Mexico. Col. Grayson's collection, with others made in Northwestern Mexico, were kindly placed in my hands by Prof. Henry, of the Smithsonian Institution, for examination, with a view to furnishing a catalogue of them, in which the notes of Col. Grayson are to be incorporated. As some time will elapse before this can be prepared and published, I have thought best, preliminary to its appearance, to describe the new species.

Several of the species have MS. names given them by Prof. Baird, which in all such cases have been retained.

1. **Harporhynchus graysoni,** Baird, MS.

Male. Above of a rather dull reddish-brown, the front paler, a blackish spot in front of and under the eye; chin, upper part of throat and sides of the head pale ochreous, the latter marked with narrow faint dusky bars; tail dark liver-brown, the outer three

feathers with a grayish spot on the inner web at the end; quills of the same color as the tail, the larger ones narrowly edged with dull white, the others with dull pale rufous; the entire under-plumage is pale yellowish fulvous, sides darker, with longitudinal brown stripes; bill black; tarsi and toes blackish-brown.

Length (fresh) 11½ in.; wing 4¼; tail 5¼; bill ¾; tarsi 1⅜.

Habitat. Socorro Island, Mexico. Collected by Col. A. J. Grayson, June, 1865. Type in Museum of the Smithsonian Institution, No. 59987.

The female (No. 50808) differs in being brownish on the under-plumage, without any of the yellowish tint.

Remarks. This is so distinct from all others of the genus, that no comparisons are required.

Note by Col. Grayson.

"*Socorro Thrush, Mocking-Bird.* Iris brown; bill and feet black, nails do.; soles of feet dull yellow. First primary very short or spurious, third and fourth longest; tails lightly forked when closed.

"Not very abundant, but seems to be well distributed over the island. It has all the characteristics of the true Mocking-Bird (*Mimus polyglottus*) in its habits. Of solitary disposition, it attacks every bird of its own species that approaches its usual haunts. There was one that took up its quarters in our camp, and was certainly the tamest bird of this genus I ever saw. He appeared to take pleasure in our society, and attacked furiously every bird that came near us; he doubtless regarded us as his own property, often perching upon the table when we were taking our meals, and eating from our hands, as though he had been brought up to this kind of treatment; at times ascending to the branches over our heads, he would break forth into loud and mellow song, very thrush-like. In the still hours of the night, while roosting on the branches near us, he would sometimes utter a few dreamy notes, recalling to mind the well-known habits of the true Mocking-Bird."

2. Cistothorus æquatorialis.

Male. Upper plumage brownish rufous, brightest on the rump; the feathers of the crown and hind neck have their centres marked with paler, nearly obsolete stripes; a stripe of pale rufous extends from over the eye to the hind neck, sides of the head and neck clear light rufous; a narrow dark brown line runs from the angle of the mouth under the eye; the interscapular feathers are blackish-brown, with conspicuous shaft stripes of pale fulvous; tail light rufous, with transverse narrow bars of black, on the central feathers there are thirteen bars, on the others they are broader and wider apart; quills dark umber-brown, the outer primaries narrowly margined with white, the outer webs of the smaller quills and the wing coverts are light rufous, more or less transversely marked with blackish-brown; the under surface is pale rufous, whitish on the throat and middle of the abdomen, brighter on the flanks and under tail coverts; under wing coverts whitish; upper mandible light-brown, the under pale yellowish-white, dusky at the tip; tarsi and toes yellowish-white.

Length (skin) about $4\frac{1}{2}$ in.; wing $1\frac{3}{4}$; tail $1\frac{5}{8}$; bill $\frac{7}{16}$; tarsi $\frac{3}{4}$.

Habitat. Pichincha, Ecuador. Type in the Museum of Vassar College, from the collection of Prof. J. Orton.

Remarks. This species seems of a somewhat stouter form than *C. stellaris*, with longer tarsi and bill; the colors are lighter and more rufous; it may be distinguished by the absence of dark brown on the crown, and its clear rufous uropygium; the tail also is rufous, with narrower and more numerous bands.

3. Troglodytes insularis, Baird, MS.

Male. Plumage above of a dull light brown, slightly rufescent, and crossed with narrow faint dusky bars, front paler, the feathers of the crown have lighter margins; the concealed feathers of the rump end with white; lores, a narrow line over the eye, sides of the head, and the entire under-plumage of a clear pale fulvous, the under-tail coverts with dusky bars; tail light brown, crossed with numerous dark brown bars, on the outer feathers the interspaces are whitish; the primary and secondary quills have their inner webs dark liver-brown, the outer webs are light brown with whitish indentations, tertiaries light brown, barred with darker brown; upper mandible brown, the under yellowish-white, dusky at the end; tarsi and toes yellowish-brown.

Length (fresh) 5 in.; wing $1\frac{7}{8}$; tail $1\frac{3}{4}$; bill $\frac{5}{8}$; tarsi $\frac{3}{4}$.

Habitat. Socorro Island, Mexico. Collected by Col. A. J. Grayson. Type in Mus. Smithsonian Institution, No. 50810.

Remarks. This somewhat resembles *T. inquietus* from Panama, but that species has a stouter bill, the colors are more rufous, and the bars more clearly defined; the flanks and under-tail coverts are of a darker rufous, the former faintly barred, the latter with dark brown bars and ending with white.

Note by Col. Grayson.

"*Socorro Wren.* Iris brown; bill dark brown above, under mandible paler; feet brown, nails black; wings much rounded, the fifth and sixth primaries longest.

"This busy little wren is the most common bird I met with upon the Island, and everywhere its cheerful song may be heard in the trees, or among the brambles and rocks; like all the birds peculiar to this Island, it is very tame. I often saw it feeding upon dead land-crabs; and I may here remark, that all the birds inhabiting the Island, with the exception of doves and parrots, subsist more or less upon this crustacean."

4. Parula insularis.

Male. Plumage above of a clear bluish-gray, a patch of dull greenish-yellow in the middle of the back; a blackish mark surrounds the fore part of the eye; tail feathers brownish-black, with margins the color of the back, the outer two feathers on each side have a small spot of dull white on the inner web near the end; the smaller wing coverts and exposed portions of the others, and of the inner quills, are the color of the back; the concealed parts of the middle and larger coverts are black, the ends of both largely marked with white; the quills are blackish-brown, the outer with narrow whitish edges; inside of wings white; under-plumage bright yellow, deepening to orange on the upper breast and on the flanks, lower part of abdomen light fulvous, in the middle and on the under tail coverts creamy-

white, thighs light ashy brown; upper mandible black, the under yellow, with the tip brown; tarsi and toes brown.

Length (skin) 4½ in.; wing 2⅛; tail 1⅞; bill $\frac{7}{16}$; tarsi ¾.

Habitat. Tres Marias Islands, Mexico. Collected by Col. A. J. Grayson. Type in Mus. Smithsonian Institution, No. 50796. Four specimens in the collection are all males.

In the collection made by Col. Grayson at Socorro Island, are eight specimens of *Parula*, only one of which has the sex indicated, viz., No. 50804, a female; they are probably the same as the males from the Tres Marias; they differ in having the upper plumage more gray, scarcely showing any shading of blue, but with the rump tinged with greenish-yellow, and the quills and tail feathers edged with the same color; below they are of a paler yellow; all the Socorro Island birds are much alike, which may be due to seasonal change, as it is not probable that all the specimens are females.

Remarks. Col. Grayson says of this species, "perhaps *Parula pitiayumi*," but they are very distinct. That species is of a deeper and more decided blue above than all others of the genus, whereas the present bird is paler. *P. pitiayumi* is entirely of a deep yellow below, with the lores a decided black; in the present species the lower part of the abdomen is whitish and the lores dusky; it also has the tail longer and the wings shorter than those of *P. pitiayumi.*

Note by Col. Grayson.

"Iris brown; bill black above, dull yellow below towards the base and black at tip; feet brown, with yellow soles, claws dark brown; indistinct shady bars across the upper part of tail feathers. This bird seems to be identical with the Tres Marias species, and is quite common on the Socorro; it is a little larger than the Marias' bird, and less white at the extremities of the tail feathers."

5. Hæmophila sumichrasti.

Female. The feathers of the back are pale rufous, broadly marked down their centres with dark brown, the rump is immaculate and the upper tail coverts bright rufous; the feathers of the crown have dark brown shaft-stripes, with their edges brighter rufous than those of the back, there is a narrow cinereous stripe from the bill over the centre of the crown to the hind neck; a broader stripe of ashy-white extends from the bill over the eye, along each side of the crown as far back as the central stripe; below, and bordering this, is a brownish-red postocular stripe, also one from the bill to the eye; sides of the head and of the neck, lower part of the throat and the breast, of a pale ashy color, upper part of throat and abdomen grayish-white, the latter washed with very pale rufous, flanks and under tail coverts light rufous; a short, narrow brown line extends back from the angle of the mouth, and another parallel to it down the side of the chin on each side; the two central tail feathers are of a rather bright rufous, and are crossed with dusky, nearly obsolete bars, the other tail feathers have their inner webs brownish-rufous, the outer webs colored like the central feathers, the outer feather very pale rufous; quills liver-brown, margined with dull pale rufous, smaller wing coverts deep bright rufous, the middle and greater coverts blackish-brown edged with very pale rufous; "iris brownish-red; upper mandible brown, the lower mandible and feet fleshy."

Length (skin) 5⅝ in.; wing 2½; tail 2⅝; tarsi ¾.

Habitat. Tuchitan, Tehuantepec, Mexico. Collected by Prof. F. Sumichrast, September 8, 1868. Type in Mus. Smithsonian Institution, No. 54139.

Remarks. With the exception of the very different markings about the head, this species in coloring much resembles my *H. melanotis;* but it is much smaller, and differs from it in there being no black on the crown or sides of the head, and in having two narrow stripes extending downwards from the bill, on each side of the throat.

I found a single specimen of this species in a remarkably fine collection of birds made by Prof. F. Sumichrast, in Southwestern Mexico, belonging to the Smithsonian Institution, and submitted to me for examination by Prof. Henry. It contains many species of much interest, but so far this is the only one I feel satisfied to describe as new.

Since my determination of it as a new species, I have received a letter from Prof. Sumichrast, containing a full description and an accurate drawing of the head, apparently of the same bird, which he writes he is tempted to consider new. It is, therefore, with much pleasure I dedicate it to him.

6. Pipilo carmani.

Male. Whole upper plumage, head, throat, and upper part of the breast olivaceous brown, with a reddish cast; there is a spot of white on the centre of the throat (this last character varies in size in different individuals); tail blackish-brown, edged with olivaceous and crossed with almost obsolete dusky bars, the outer two feathers on each side with an irregular oval spot of white on their inner webs at the end; quills dark hair-brown, with grayish margins; the wing coverts blackish-brown, the greater and middle coverts, the scapulars and the tertiaries spotted with white at their ends; lower part of breast and middle of abdomen white, sides broadly marked with bright ferruginous, the under tail coverts pale ferruginous; upper mandible brownish-black, the under paler; tarsi and toes light fleshy-brown.

Length 6½ in.; wing 2¾; tail 3; bill ½; tarsi 1

The female differs only in having the color of the upper plumage and that of the throat of a lighter brown; the coloring of the abdomen, and the sides are the same in both sexes.

Habitat. Socorro Island, Mexico. Collected by Col. A. J. Grayson, June, 1865. Types in Mus. Smithsonian Institution, No. 50843, No. 39990.

Remarks. As will be seen, this is quite a diminutive species; its style of coloring is like that of *P. erythropthalmus*, *P.*

arcticus, &c. It may readily be known from all others by its smaller size.

Col. Grayson requested that this species might be named after his friend, Dr. B. F. Carman, of Mazatlan, to whom he was under many obligations. With this request it gratifies me to be able to comply.

Note by Col. Grayson.

"Iris reddish-hazel; bill black; tarsi and toes brown; nails brown.

"This is an abundant species, found in all the thickets of the Island; many of them took up their abode in our camp, picking up crumbs about our feet, as tame as domestic fowls. They delighted in bathing in the water we had placed in a basin on the ground for their use, and frequent combats took place between them for this privilege. It was through the agency of this species that water was discovered in a locality where we had not the remotest idea of finding it, and for this providential service he was a welcome visitor and a privileged character."

7. Attila cinnamomeus.

Male. Upper plumage of a rather light reddish cinnamon, the rump and upper tail coverts pale yellowish-cinnamon, the coverts lightest in color; front, superciliary stripe and sides of the head clear light yellow, all the feathers having black shaft-stripes; the throat and breast are clear yellow, the centres of the feathers with dusky flammulations, abdomen and under tail coverts bright lemon-yellow, sides of the breast and flanks bright pale cinnamon, thighs yellow, tinged with cinnamon; tail clear cinnamon, of a brighter color than the back; quills dark brown, the primaries edged with grayish, the secondaries with light cinnamon; the smaller wing coverts are the color of the back, the middle and larger are blackish-brown ending with cinnamon; under wing coverts bright yellow, axillaries tinged with cinnamon; bill brownish horn-color, both mandibles whitish at tip, the hook much elongated; tarsi and toes brown.

Length (skin) 8½ in.; wing 3⅞; tail 3½; bill 1; tarsi 1.

The female differs in having grayish-white on the front, sides of the head, throat and breast, in place of the yellow of the male; the abdomen is creamy-white, with a slight tinge of yellow on the lower part; under tail coverts very pale yellow; under wing coverts light yellow.

Habitat. Mazatlan, Mexico. Collected by Col. A. J. Grayson. Types in Museum of Smithsonian Institute, ♂ No. 58231; ♀ No. 58232.

Remarks. Three specimens are in Col. Grayson's collection, two marked *A. sclateri* and one *A. citreopygius*, but I think it a very distinct species from both; its affinities are with *A. citreopygius*, from which it differs in its upper plumage being not at all tinged with brown, the light marking on the rump apparently more restricted, the yellow coloring below clearer and brighter, without any brown on the sides of the breast, and the under wing coverts yellow—not light cinnamon as in that species; the tail is lighter in color, not inclining to brown; the feathers overlying the pleura are brighter in color and more elongated; it is larger than *A. citreopygius*, the tail being half an inch more in length than that of the other; the bill is more slender, with the hook conspicuously longer, and much lighter in color. *A. sclateri* has not been found, I think, north of Costa Rica; it may be distinguished by the olive-green which prevails in its upper plumage, also on the neck and breast.

8. Todirostrum superciliaris.

Crown and hind neck dark grayish-plumbeous, the front blackish; a white stripe extends from over the eye quite forward on the bill; lores blackish; back and rump bright olive-green; tail black, margined with olive-green; wing coverts black, the ends broadly marked with bright yellow; quills brownish-black, edged with bright yellow; under wing coverts yellow; the under-plumage is pearly-white, with the upper part of the breast light plumbeous; a wash of pale yellow on the lower part of the abdomen and under tail coverts; sides under the wings light olive-green; bill black, whitish at the end; tarsi and toes pale brown.

Length 3⅞ in.; wing 2; tail 1⅜; tarsi ¾; bill ½.

Habitat. Venezuela? Collected by Mr. Christopher Wood, of Philadelphia. Type in my collection.

Remarks. In general appearance this comes nearest to *T. schistaceiceps*, Scl., but has the crown of a lighter shade; is much whiter below, the ashy coloring occupying only a small space on the upper part of the breast; the yellow markings on the wings are much broader and brighter; the wings, tarsi and tail are longer; a very distinguishing character is the white stripe, which runs from over the eye to the nostrils, on each side of the crown, whereas *T. schistaceiceps* has a white spot in front of the eye, not extending over it.

9. Elainea macilvainii.

Upper plumage greenish-olive, yellowish-green on the rump; front and crown blackish-brown, with a crest of light sulphur-yellow; a line from the bill over the eye and circle round the eye grayish-white; lores dusky; tail light umber-brown, edged with yellowish-green; the smaller wing coverts are colored like the back, the other coverts are dark brown, the middle ones ending with very pale yellow, forming a transverse band, and the larger edged with the same color; quills blackish-brown, the primaries narrowly and the secondaries rather broadly margined with pale yellow; under wing coverts light yellow; chin and throat grayish-white, sides of the breast dusky olive-green, middle of the breast pale yellow, the feathers with ashy centres, the abdomen and under tail coverts are of a clear, rather pale yellow; bill and feet black.

Length 4¾ in.; wing 2¼; tail 2⅛; tarsi ⅝; bill ⅜.

Habitat. Venezuela? Collected by Mr. Christopher Wood. Type in my collection.

Remarks. This fly-catcher in coloring most resembles *E. placens*, Scl., but is much smaller, with the upper plumage of a darker shade; the wings and tail each measure half an inch less than those of that species; the top of the head is darker and the crest much paler; by these differences it is easily distinguished.

I have named this species in compliment to my friend, J. H. McIlvain, Esq., of Philadelphia, an ethnologist as well as ornithologist, to whose liberality Mr. Wood is indebted for the opportunity to make the collection, from which I obtained this and the preceding species.

Unfortunately, Mr. Wood lost a considerable portion of his collection by shipwreck.

10. Empidonax fulvipectus.

Male. The entire upper plumage is brownish-olive, the crown and lengthened crest are a little darker; lores dusky gray; a conspicuous circle of pale yellow around the eye; tail dark brown, the outer web of the outside feather dull white, the other feathers edged with olive; the smaller wing coverts are the color of the back, the middle and larger are blackish-brown, ending with dull pale fulvous, forming two bars across the wing; quills blackish-brown, with olive-green margins; under wing coverts pale tawny yellow; under plumage dull yellow, the chin grayish, the breast and upper part of the abdomen of an olivaceous brownish-fulvous, middle of abdomen light buffy yellow; the upper mandible is brownish-black, the under pale yellow; tarsi and toes brownish-black.

Length $5\frac{3}{8}$ in.; wing 3; tail $2\frac{3}{4}$; bill $\frac{7}{16}$; tarsi $\frac{5}{8}$.

The bill is very narrow and tapers regularly from the base, not the least bulging at the sides; the third quill is the longest, second and fourth nearly as long, first and sixth equal.

Habitat. City of Mexico. Type in my collection.

Remarks. This species in its peculiar coloring is somewhat like *E. bairdii*, Scl., but may readily be known by its more slender form, longer wings and tail, its general duller color, decided brownish breast, and slender bill, this last in *E. bairdii* being quite broad.

The bill exceeds in length that of *E. hammondi*, while it is quite as narrow at the base.

11. Trogon eximius.

Trogon viridis, Lawr., Ann. Lyc. N. Y., Vol. vii., p. 290.

Male. Crown and hind neck dark violet-blue, back of a shining

dark green, more or less mixed with violet-blue, rump and upper tail coverts deep violet-blue; front, cheeks, chin, and throat black; breast fine violet-blue, connecting with the same color on the hind neck; abdomen and under tail coverts very deep orange, sides dark grayish slate-color, thighs sooty black; two middle tail feathers green, with a decided wash of blue, the outer webs of the next two feathers are of the same color, the inner webs black—the ends of all these end narrowly with black, the outer three feathers are white, their concealed bases being black; wings black; the quill feathers have their bases white, the primaries are narrowly edged with white for two-thirds their length; the upper mandible is whitish horn-color, with the base pale plumbeous, the under is dark plumbeous; feet dark brown, the soles yellow.

Mr. J. Galbraith, in his note of this species, says, "very common, light blue about the eyes, irides brown."

Length (fresh) 10½ in.; wing 5⅝; tail 6; tarsi ½.

The female is of a plumbeous slate-color, grayish on the breast, the abdomen and under tail coverts orange; primaries of a rich dark brown; the wing coverts and smaller quills are black, crossed with very narrow undulating white lines, rather widely separated; tail blackish-brown, with a purplish gloss, the three lateral feathers are white at their ends, the outer web of the outer feather is barred with white, and has a few irregular bars of the same color on the inner web, both webs of the next feather also have a few white bars.

Habitat. Isthmus of Panama. Types in my collection.

Remarks. In my catalogue of birds from Panama, I included this species as *T. viridis*, Linn.; but as it differs so materially from that species, I consider it to be distinct.

In general coloration it somewhat resembles *T. viridis*, but is rather smaller; the back is mixed with violet-blue, and the rump is of a more intense violet-blue color; the wash of blue on the tail is more apparent, and the orange of the under parts is of a deeper shade; but the most distinguishing character is that of the outer tail feathers, which have a much greater extent of white on their terminal portions, when the tail is closed, the under side appears entirely white, the black bases being quite concealed, whereas in *T. viridis* the ends of the feathers only are white, the black basal portions showing conspicuously.

Specimens referred to *T. venustus*, Cab., by Mr. Cassin, are in Prof. Orton's collection, from Archidona, Ecuador; they agree quite well with Cabanis' description, except in being of the same size as *T. viridis*, not "somewhat smaller," and that the abdomen is deep orange; he says, "belly yellowish-orange;" in describing *T. viridis*, he has, "belly orange," but this is perhaps a variable character.

Compared with examples of *T. viridis* from Bahia, Prof. Orton's specimens are more of an azure instead of violet-blue, the upper plumage more golden, the rump less violet, being mixed with green; the middle tail feathers are green, without any shading of blue, and the abdomen and under tail coverts of a deeper orange; in the extent of white on the end of the tail feathers, they agree with *T. viridis*.

These comparative differences with *T. viridis* are very similar to those pointed out by Dr. Cabanis; as he makes no allusion to the ending of the outer tail feathers, I infer they are the same in both.

Specimens exactly corresponding with those from Archidona are in collections received by Prof. Orton from Mr. J. Hauxwell, at Pebas on the Upper Amazon; also, I have an example from Bogota.

The new species differs from the specimens above spoken of as *T. venustus*, in the head and breast being of a deeper blue, the rump intensely violet instead of greenish; the middle tail feathers, instead of being green, are more blue even than those of *T. viridis;* the greater extent of white on the outer tail feathers distinguishes it from this as well as from *T. viridis;* the orange coloring below is of a deeper color than in either *T. venustus* or *T. viridis*.

12. Chlorostilbon caribæus.

Male. Crown of a glittering pale golden-green; upper plumage and wing coverts grass-green, somewhat golden; the entire under-plumage

is of a brilliant uniform emerald-green, with a few white feathers on the flanks; tail steel-blue; wings brownish-purple; bill black; feet dark brown.

Length about 3¼ in.; wing 1¾; tail 1⅛; bill ⅝.

Habitat. Island of Curaçao. Type in my collection.

Remarks. Its nearest ally appears to be *C. atala*, but that species is entirely of a golden-green; the new species is only slightly golden above, not the least so in its under-plumage, where it is of a much darker shade of green, and more glittering; the tail is strikingly larger and the feathers broader, the color of which is more blue, that of *C. atala* being more of a steel-black; the wings are longer, and the bill appears to be stouter than in that species.

Three specimens were presented to me by my friend, Mr. T. Bland; he obtained them from Mr. Henry H. Raven, who brought them from the Island of Curaçao. Two of the specimens are immature males.

13. Conurus holochlorus var. brevipes, Baird, M. S.

Male. The general plumage is grass-green; the abdomen is lighter and has a yellowish cast; ends and inner margins of quills blackish; inside of quills and under-surface of the tail dull yellowish; bill yellowish-white; feet light yellow.

There is no difference in the plumage of the sexes.

Length (fresh) 12¼ in.; wing 6⅜; tail 6½; tarsi ⅝.

Habitat. Socorro Island, Mexico. Collected by Col. A. J. Grayson, "Spring of 1865." Type in Mus. Smithsonian Institution, No. 39971.

Remarks. Six specimens before me, compared with two examples of *C. holochlorus* from Salvador, have the toes uniformly shorter; the wings of the Socorro Island bird are half an inch shorter than in those from Salvador; in plumage there is no perceptible difference in the two forms.

The toes of the two forms measure as follows:—

C. holochlorus—Outer toe $\frac{15}{16}$; middle $1\frac{1}{8}$; inner $\frac{3}{4}$; hind $\frac{1}{2}$.
C. brevipes— " $\frac{3}{4}$; " $\frac{7}{8}$; " $\frac{5}{8}$; " $\frac{3}{8}$.

Note by Col. Grayson.

"*Socorro Parrot.* Iris reddish-brown; bill yellowish-white, dark or black at point; feet pale yellow, with brownish scutellæ; nails dark brown. Contents of the stomach, kernels of nuts.

"This Parakeet is quite abundant and evidently belonging to this locality, which it never leaves; they are to be met with in flocks or in pairs. In the mornings they left the cove in which we were encamped, for the higher regions of the interior, to feed, returning again in the evening to roost; this cove, in which the trees are larger and the shade more dense than in other parts of the Island, seems to be their favorite resort. I saw them at times walking about on the ground beneath these trees, apparently picking up clay or gravel. They are remarkably tame, exhibiting no fear in our presence; three cages were soon filled with them, which were caught by hand, and their constant whistling for their mates brought many of them into camp, perching upon the cages and elsewhere. They feed upon a hard nut which they find in the mountain-gorges, and on account of the inaccessible localities where this fruit grew, I was unable to find it; the powerful jaws of this Parakeet would indicate the fruit to be very hard."

14. Leptoptila bonapartii.

Male. Above of a light brownish-olive, a little browner on the wings and more olivaceous on the lower back and upper tail coverts, hind neck grayish, with a bluish tinge; front whitish, with a slight roseate tint, crown plumbeous-blue, grayish on the forward part and darker towards the occiput; throat white, sides of the head light brownish-vinaceous, this color extending somewhat on the hind neck; breast and upper part of abdomen of a pale roseate color, lower part of abdomen and under tail coverts white, sides under the wings light

cinnamon-brown; four middle tail feathers colored like the back, the others purplish-black, terminating in white; under wing coverts dark bright cinnamon; the inner webs of the primaries light cinnamon, the larger quills are of a fine dark brown, the exposed portions of the others colored like the back; bill black; feet yellow.

Length 10½ in.; wing 5¾; tail 4; bill $\frac{11}{16}$; tarsi 1$\frac{3}{16}$.

Habitat. Mexico (A. Sallé). Type in Mus. Smithsonian Institution, No. 29693.

Remarks. This specimen was received from Mr. Sallé and labelled by him "*L. albifrons, Bp.;*" the reverse side of the lable is marked "♂ P. V. Juin, '59." It no doubt was supervised by Bonaparte, as Sallé's birds mostly were; it is very distinct from the species, which is now admitted to be entitled to bear that name, viz., the bird for some time known as *L. brachyptera*, Gray.

I found this specimen in the collection of the Smithsonian Institution (where there are numerous specimens of the true *L. albifrons*) about two years ago, and hesitated to describe it as new, fearing to add to the confusion attached to the name of *albifrons*. In general coloration it somewhat resembles that species, which differs in being of a lighter olive above and more roseate on the breast, it has a much longer tail, with no plumbeous on the crown, and may be known from all its allies by the inner webs of the primaries being just edged with pale cinnamon.

L. plumbeiceps, Scl. & Salv. (P. Z. S., 1868, p. 59), differs in being dark brown above, in having the plumage of the breast somewhat darker, and the under-lining of the wings of a more intense color; in the new bird the plumbeous is confined to the crown, and does not extend on the hind neck, as in *L. plumbeiceps*.

It really comes nearest to *L. rufaxilla*, from South America, in general coloration, but that species has the breast more roseate, the blue of the head lighter and more restricted, the sides of the head cinnamon color, and the feet smaller.

Under the circumstances I consider the name conferred a very appropriate one.

15. **Zenaidura graysoni**, Baird, M. S.

Male. Entire plumage above olivaceous-brown, with a rufescent tinge, the crown of a darker brown; front, sides of the head, and the whole under-plumage dark cinnamon red, except the chin, which is paler; auricular spot black, but not very distinct; the sides under the wings grayish-plumbeous; the two central tail feathers are of the same color as the back, with their centres blackish-plumbeous; the next feather on each side has the outer web and end colored like the back, with a rather indistinct subterminal black bar on the inner web, below which the inner web is dark plumbeous, the next pair on each side are grayish-plumbeous, the outer webs broadly margined and tipped with brown, and having the subterminal black bar more distinct, the next two on each side of a light plumbeous-gray, just margined with brown on the outer webs, and with the black bars still darker, the outer feather has its end and the outer web pale bluish-white, the inner web dark plumbeous, the black spot mostly confined to the inner web; the tail feathers underneath are brownish-black, except the outer web of the lateral one, the end of which and those of the next two are light plumbeous, the ends of the others becoming darker towards the central ones, and more or less tinged with brown; primary and secondary quills blackish-brown, the outer primaries just edged with white; wing coverts and tertiaries of a rather lighter reddish-brown than the back, and marked with oval black spots, most conspicuous on the tertiaries; under wing coverts grayish-plumbeous; bill dark brown, base of under mandible yellowish; feet reddish.

Length (fresh) 12 in.; wing $5\frac{7}{8}$; tail 5; bill $\frac{13}{16}$; tarsi 1.

Habitat. Socorro Island, Mexico. Collected by Col. A. J. Grayson. Type in Museum Smithsonian Institution, No. 50855.

There is no difference in the plumage of the sexes. Three specimens are in the collection, one of which is rather more olivaceous on the back; otherwise all are alike.

The tail consists of fourteen feathers, as in the two others of the genus; the shape of the tail is like that of *Z. yucatanensis*, the feathers not pointed as in *Z. carolinensis.*

Remarks. It bears no resemblance to *Z. carolinensis;* compared with *Z. yucatanensis*, they are somewhat alike in coloring below, but in *Z. graysoni* the color is more uniform and much darker; it differs from both species in the absence of metallic coloring on the neck.

Note and observations by Col. Grayson.

"*The Solitary Dove.* Iris dark brown; bill dark brown, with a slight tinge of red; base of under mandible reddish-purple, as also the base of the gape; tarsi and toes reddish flesh-color, posterior portion of which is paler, nails brownish-black; bare space extending from base of bill to and around the eye plumbeous; second and third primary quills longest; tail graduated, with fourteen feathers, outer ones 1½ inches shorter than the central. Not abundant.

"Of all the birds I met with in the Island, this seemed to be the most lonely; not a flock or even a pair were ever seen together. They are remarkably tame, perhaps more so than any bird of this order; one was captured by hand as it came into our camp, and perched upon the rude table on which I was at work. Its melancholy look appeared to be in keeping with the solitude of, and its sombre plumage corresponding with the gray brush and brown volcanic rock composing its wild home. In form and appearance, when alive, it resembles the common Turtle Dove.

"The first specimen seen and captured was by my son, Edward Grayson, whose name this evidently new species should bear—not for this discovery alone, but for the assistance often rendered, in making my collections, and more particularly on this expedition, in which he was indefatigable, even to enthusiasm, in aiding its progress, as well as the advancement of science, in the cause of which he came to an untimely death!"

16. Note on *Rallus longirostris*, Boddaert.

I received a specimen of *Rallus* in a collection from Bahia, which I was unable to determine and was inclined to consider undescribed; from the stoutness of its bill, I named it provisionally *R. crassirostris.* In 1868 Messrs. Sclater and Salvin gave a most valuable and complete "Synopsis of the American Rails" (Proc. Zool. Soc., p. 442). Not being able to make it agree satisfactorily with any of the species therein enumerated, and an opportunity offering to send it to them, as they had lately so fully investigated the Rallidæ, I did so.

On returning it, Mr. Sclater wrote, "is true *longirostris*, figured Pl. Enl. 849." I infer from this (although not distinctly so stated) that they consider it different from *crepitans;* the two birds are very unlike, and no one with the two before him could confound them. If right in my inference, this would be a change of opinion since the publication of the Synopsis, wherein *crepitans* is put as a synonym of *longirostris;* this view has also been taken by other recent writers, adopting Mr. Cassin's suggestion of their probable identity.

I find it agrees with Buffon's plate (which is of reduced size) in the apparent color of the back, also in the form and stoutness of the bill; but they differ in the coloring below, which in the plate is more like *crepitans*, being of an ashy-fulvous, instead of uniform light rufous; they differ also in the bars on the flanks. The only characters, then, on which it can assume the name of *longirostris*, are the shape of the bill and the color of the back, if these are deemed sufficient to overrule the coloring below, in which the plate resembles *crepitans.*

My specimen differed so much from *crepitans*, as well as from all others, that I considered it undescribed at the time, taking for a settled fact that *crepitans* and *longirostris* were the same; if the Bahia bird is to take the name of *longirostris*, it being certainly distinct from *crepitans*, the latter name must be restored to full specific rank.

The bird from Bahia is grayish-olive above, flammulated with blackish-brown; the under-plumage is light rufous, the throat white; a stripe of dull rufous extends from over the eye to the bill; the sides and under wing coverts are brown, with transverse narrow white bars; the upper mandible is brown on the ridge and at the end, the remaining part and the lower mandible dark yellow; feet yellow.

Length 12 in.; wing 5½; tail 2¼; bill 2¼ to rictus; tarsi 1¾.

It is smaller in all its measurements than *crepitans*, and has the bill fully twice as deep as in that species, the tarsi are shorter, the feathers of the back are bordered with grayish-olive instead of light bluish-cinereous, and the color below of a clear light rufous instead of an ashy-fulvous; the colors are more like those of *R. elegans*, but are lighter; its smaller size, shorter and stouter bill, distinguishes it also from that species.

The description of *R. longirostris* in Messrs. Sclater and Salvin's Synopsis is evidently taken from United States specimens of *crepitans*. I have seen no description at all applicable to my Bahia specimen, and if the evidence is not considered sufficient for it to assume the name of *longirostris*, it may then bear that of *crassirostris*.

The new species of *Vireo*, described below, is added to my paper by request of Professor Baird. The description and remarks are his, without alteration by me.

Vireosylvia magister, BAIRD, n. s.

Habitat. Belize, Br. Honduras.

Bill stout and lengthened. Wings considerably longer than the nearly even, though rather short and decidedly rounded tail; the 1st quill about equal to the 6th, or very little longer; the 3d longest; the 2d and 4th a little shorter. No spurious primary.

Upper parts olive-green, brightest on rump and tail; the head above, and to a less degree the back, with a slight gloss of ashy, but without forming a cap. Beneath dull olivaceous-white, the belly (and

the tibiæ somewhat) rather buffy yellow; the sides of neck and body olivaceous. Axillars and inner wing coverts sulphur yellow; the crissum similarly colored, but duller. Quills almost black, edged internally with grayish-white, externally with olive; tail feathers more olive-brown, edged internally with greenish-yellow, externally with bright olive. A broad stripe of pale yellowish from bill over and behind eye to nape, becoming paler when it reaches the eye, and with a faint indication of a dusky border above it; a dusky brown, well-marked stripe from bill to eye, and a small spot of the same behind it. The bill is almost black, except the basal half of lower mandible, which appears to have been nearly white. The legs are blackish-plumbeous. "Iris brown" (*Wood*)?

Total length, 6.00; wing, 3.00; tail, 2.50; difference between 9th and longest quills, .60; exposed portion of 1st primary, 1.90, of 2d, 2.15, of longest (measured from exposed base of 1st primary), 2.24; length of bill from forehead, .80, from nostril, .46, along gape, .90; tarsus, .83; middle toe and claw, .70, claw alone, .24; hind toe and claw, .56, claw alone, .27.

This interesting new species of *Vireo* is among the largest of the genus, considerably exceeding in size *V. olivacea*, and fully equal to *V. calidris* of Jamaica. In general appearance it closely resembles the latter, but there is even less of the grayish cap, and the dusky mandibular stripe is wanting; the under parts are rather more olivaceous; the bill is of about the same size. The much rounded wings constitute an important character of the species.

The much larger size, almost black bill and feet, absence of ashy cap, more olivaceous under-parts, will readily distinguish the species from *V. olivacea.* The wings, also, are much more rounded; the first quill about equal to the sixth, instead of being but little shorter than the fourth. The wing formula is much the same as that of *V. agilis*, but the size and coloration are very different.

This species is one of several new species of birds in a collection made at Belize, British Honduras, for Dr. Henry Bryant, by Mr. Christopher Wood.

II.—*Notes on the genus* PINERIA, *and on the lingual dentition of* PINERIA VIEQUENSIS, *Pfeiffer*.

BY THOMAS BLAND AND W. G. BINNEY.

Read March 20, 1871.

THE genus *Pineria* was established by Poey in 1854 (*Memorias*, I., 428), and thus characterized:—

> T. bulimiformis, imperforata, turrita, apertura rotundata, peristoma simplex, rectum, undique acutum. Animal nudipes tentaculis duobus retractilibus instructum, apice oculatis; labrum rotundatum; reptatio sinuosa.

Poey described two species, *P. terebra* and *Beathiana*, both from the Isle of Pines, of which figures are given (*Memorias*, *l. c.*, tab. 34, f. 12–18).

He remarks that he had examined the living animal of *P. Beathiana* with great care, but could detect no trace of "inferior tentacles," and Dr. Gundlach had satisfied himself of their absence in *P. terebra*. Observing that the form of shell (columella excepted) and sculpture of the former species was somewhat like that of *Macroceramus turricula*, Pfr., Poey studied its soft parts and found such tentacles existing.

In 1856 Pfeiffer (*Malak. Bl.* III. p. 46) described *Bulimus Viequensis*, from Viéque, and suggested its alliance with *Pineria*. The species is figured in *Notit. Conch.* Fasc. xxxi. t. 93, f. 39–41.

The late Rev. H. Parkinson, in 1857, discovered *P. Viequensis* in Barbados.

In 1858 Fischer (*Journ. Conch.* vii. 184, t. 7, f. 7–8) described *Helix Schrammi*, from Guadaloupe.

Pfeiffer (*Mon.* vi. 343) adopts the genus *Pineria*, for *B. Viequensis*, *H. Schrammi*, and Poey's two species, and remarking on the evident affinity of Fischer's species with *Vie-*

quensis, asks whether both should not be transferred to *Macroceramus.*

H. and A. Adams (*Gen.* ii. 163) place Poey's species in *Macroceramus*, while *Pineria* is adopted by v. Martens (*Albers*, *2d, ed*) as a subgenus of *Pupa.*

We have compared specimens of *Helix Schrammi*, received from M. Crosse, *Pineria Viequensis* from Barbados, and also of *P. Schrammi* from Anguilla, St. Martin, and St. Bartholomew, and are satisfied that all are of one and the same species, which, by priority, is entitled to the specific name, *Viequensis.*

We obtained the jaw and odontophore from a dead specimen of this species, collected at the east end of St. Martin, by Dr. van Rijgersma, for which we are indebted to Mr. Robert Swift, but no living example has at present been received to enable us to form an opinion as to the presence or absence of the "inferior tentacles."

With respect to the alleged absence of those organs in *Pineria*, the following is a copy of a note by Poey, published in 1865, with a Catalogue of the Terrestrial and Fluviatile Mollusks of Cuba by Arango (*Repertorio*, I. 145): "En las altas regiones de la filosofía natural, tendrán probablemente razon los que suprimen mi género *Pineria*, el cual he separado de los Macrocéramos por la razon, de que el animal no muestra ni vestigios de tentáculos inferiores. Los principios formológicos nos obligan á considerar qüe existen virtualmente; por lo que no me opongo á que se suprima."

Before the commencement of the late European war, we sent to M. Crosse, unfortunately without previous examination, the odontophore from a dead specimen of *P. terebra*, as to which we hope to have a report at no distant day.

It will be seen from what has been stated above, that an opinion has been generally entertained in favor of placing the species of *Pineria* in the genus *Macroceramus.*

Crosse and Fischer, in a late interesting paper (*Journ. de Conch.* xviii. 1, Jan. 1870) fully discussed the lingual dentition of various groups of *Cylindrella* and *Macroceramus*, and consider that they constitute a natural family, characterized by the presence, 1st, of a jaw of extreme thinness, and with folds chevroned on the median line; and 2d, of lateral teeth, more or less palm-leaf shaped, disposed in very oblique rows, which family they designate as *Cylindrellidæ*.

The authors proposed the following classification :—

FAMILY CYLINDRELLIDÆ.

1. Group A. Cylindrella (*sensu stricto*).

Two lateral teeth on either side of the rachidian tooth ; marginal teeth of a very different form, varying in number, according to the species.

This group comprises the sections *Apoma*, Beck, or *Casta*, Albers (including the sinistral species, *C. gracilis*, Wood, *C. elongata*, Chemn., *C. Agnesiana*, C. B. Ad.); *Trachelia* (*C. Brooksiana*, Gundl, &c.), and *Mychostoma*, Albers (*C. costata*, Guilding, *C. Bahamensis*, Pfr. &c.).

2. Group B. Callonia, Crosse and Fischer.

Rachidian tooth with a very long cusp ; lateral teeth more than two ; marginal teeth arranged obliquely in a continuous line with the laterals, and not distinctly characterized. Only one species known, *C. Eliotti.*

3. Group C. Thaumasia, Albers (*partim*).

Lateral teeth more than two ; marginal teeth similar to the laterals, and not to be distinguished from them.

This group includes the large species of Jamaica and Hayti, and some of those of Cuba, but none of the species of *Eucalodium.*

4. Group D. Lia, Albers (*emend.*)

Lateral teeth very numerous ; marginal teeth of the same type as the lateral teeth, and not to be distinguished from them; inner cusp simple and pointed, instead of semi-circular, as in the preceding groups.

This group includes *L. Maugeri*, Wood, *zebrina*, *Blandiana*, *macrostoma*, *Paivana*, *flexuosa*, *Gossei*, and *tricolor*, all of Jamaica, and *L. virginea* of Hayti.

5. GROUP E. MACROCERAMUS, GUILDING.

Lateral teeth very numerous, as in the preceding group; marginal teeth of the same type also; two inner cusps.

This includes forty-eight species, of which only four are found on the continent of America; the balance belong to the Antilles, particularly to Cuba, which alone has thirty-four.

The other species formerly referred to the genus *Cylindrella*, are placed by Crosse and Fischer in the genera *Eucalodium*, *Berendtia* and *Holospira*, of the family *Helicidæ;* their lingual membranes resembling those prevailing in that family. The limits of the present paper preclude our entering further on this part of the subject.

The authors remark that the three above-named genera of *Helicidæ* are localized in a relatively small portion of the American continent (Texas, Lower California, Mexico, and Guatemala), where there are very few representatives of *Cylindrella* proper, while the family *Cylindrellidæ* is largely developed in the Antilles (Cuba, Jamaica, and Hayti especially), with an entire absence of the Cylindrelliform genera belonging to *Helicidæ.*

From the subjoined descriptions of the jaw and lingual dentition of *Pineria Viequensis*, it will be seen that it belongs to the family *Cylindrellidæ* as restricted by Crosse and Fischer. If form of shell be considered, the species may be placed in the above-mentioned group E (*Macroceramus*), but from the character of the dentition it is rather a member of group A (*Cylindrella*). The resemblance of the dentition of *P. Viequensis* to that of *Cylindrella Trinitaria*, Pf. (*Amer. Jour. of Conch.*, iv., 187) is very striking.

An examination of the lingual teeth of the various forms of *Macroceramus*, and of *Pineria* from the Isle of Pines, is extremely desirable, and also of the soft parts of the latter, in order to settle the question raised by Poey as to the tentacles. In the meanwhile we continue to use the generic name *Pineria.*

The following is a description of the jaw and lingual dentition of *P. Viequensis:*

Jaw so extremely thin and delicate that it curls or folds over upon itself along the edges, and at the extremities; pale horn-color, translucent; strongly arched, subcircular; of nearly equal height throughout, the ends slightly attenuated and blunt; entire, but with the appearance of being divided perpendicularly into about twenty-eight separate sections or folds, the outer margin of each defined by a thickening of the substance of the jaw; the sections curve strongly outwards, excepting at the upper centre of the jaw, where they are arranged en chevron upon the central line; either margin serrated by the extreme outer edges of the sections or folds; generally resembling the jaws of *Macroceramus* and *Cylindrella*[*] as figured in *Ann. Lyc.* viii. 162.; *Am. Jour. Conch.* iv. 187, v. pl. xi.; *Journ. de Conch.* xviii. 1, pl. iii. and v., Jan. 1870.

Lingual membrane very long and narrow, composed of numerous rows of teeth arranged obliquely from below upwards en chevron; teeth arranged in quincunx 2. 1. 2 in each row, with several additional rudimentary marginal teeth; central teeth small, long, slender, crowded between the first laterals, its apex recurved into a rounded cusp; first lateral broad, bicuspid, base of attachment subquadrate, lower cusp very large, broader than the base, subcircular, upper cusp very small, seated on a long, slender neck, which curves gracefully outward and upward beyond the apex of the central tooth; second lateral of the same shape as the first lateral; marginal teeth five or six, arranged in a crowded row running obliquely upward and outward from near the base of the outer lateral, decreasing rapidly in length as they pass outward, long, narrow, simple, with irregularly curved apices.

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[*] Crosse and Fischer, in their description of the jaw of *Cylindrella*, remark that it is furnished with very fine ribs, which are shown under the microscope to be nothing less than a complete folding of the substance of the jaw.

On some portions of the lingual membrane the cusp of both central and lateral teeth are much more produced than on others, the lower cusp being quite spoon-shaped.

With respect to the habits of *Cylindrella* and *Macroceramus*, we are indebted to Mr. C. P. Gloyne, of Jamaica, for the information that they feed on lichens growing on walls and rocks—he has found their stomachs and intestinal canals filled with such matter. He also remarks that the sinistral species (*C. gracilis*, etc.) appear to be viviparous, as he had frequently found four or five young shells, with several whorls, within living adults, but that while he had never detected eggs, he had not seen such embryo shells in the group to which *C. sanguinea*, etc., belong (*Thaumasia*, *Cr. and Fisch.*).

III.—*Genres des Poissons de la Faune de Cuba, appartenant à la Famille* PERCIDÆ, *avec une Note d'introduction par J. Carson Brevoort.*

BY FELIPE POEY.

Read March 7th, 1871.

INTRODUCTORY NOTE.

[The difficulty in establishing a permanent generic group of animals defined by truly natural characters, is well known to naturalists, and to those more especially, who, as in the case with fishes, have to study preserved, and therefore shrunken and faded specimens. The want of a complete series of all the species and varieties, taken at all seasons and at all ages, and in both sexes, together with accurate data concerning their habits, geographical range, rarity of occurrence and appearance when fresh, causes insuperable difficulties in properly defining the genera and characterizing the species. On this account we take especial pleasure in presenting the following paper by our esteemed corresponding member, Professor Poey, of Havana, on the great group which stands at the head of the Order of Fishes, the perplexing characters of which he has sought to more clearly define and describe. Well known as a careful observer and able anatomist, he is also a diligent and indefatigable collector of specimens and of information, qualities rarely found combined in the older naturalists. He has sought to become thoroughly acquainted with the entire Fauna of the tropical island which he inhabits, and his studies have thus a peculiar and abiding value. Examining, as in the case before us, specimens of every age and at all seasons, he learns their habits and native characteristics, so as to surely fix the species and mark the genus. His generic descriptions in the following paper are so thorough, that they can hardly be disputed or misunderstood. His bibliographical knowledge withal is most extensive, enabling him to present the history of each genus and criticise the labors of his predecessors.

The paper is published as it was received, for were a translation of it to be attempted, the sense might be slightly altered, and the true meaning of the author be lost. J. C. B.]

CLASSIS PISCIUM.

Les Poissons sont des animaux vertébrés ovipares, à circulation double et complète, à respiration bronchiale, et par conséquent incomplète, ce qui fait baisser la température du sang. Le cœur est veineux, à deux cavités, séparé du sinus aortique.

La plupart ont le corps couvert d'écailles.

La locomotion s'éffectue par le moyen des nageoires, principalement par la caudale. Les nageoires pectorales représentent les membres thoraciques, et les ventrales les abdominaux. Ces nageoires sont soutenues par des rayons, tantôt épineux, tantôt mous, articulés, et le plus souvent branchus.

Les dents sont implantées sur les mâchoires. Il peut y en avoir encore au vomer, aux palatins, aux ptérygoïdiens internes, sur la langue et sur les os pharyngiens; les arcs branchiaux sont hérissés de tubercules épineux.

L'os hyoïde est très-compliqué: il soutient la membrane branchiostège, pourvue de rayons, placée sous les os operculaires, et formant avec ces derniers l'ouverture des ouïes.

Les narines n'ont pas de communication avec l'arrière-bouche.

L'œil a un cristallin globuleux et très-dur: il manque d'humeur aqueuse.

L'oreille est réduite à un sac qui représente le vestibule, et aux canaux semi-circulaires: on y trouve des otolithes.

Les vertèbres s'unissent par des surfaces concaves: elles se divisent en abdominales et caudales. Les os de la tête, comparés à ceux de l'homme, se divisent presque toujours en plusieurs pièces, qui répondent aux points d'ossification des derniers.

Les parties ordinaires *du cerveau* sont placées à la suite les unes des autres. Le pylore est presque toujours entouré de cœcums, qui remplacent le pancréas. Les reins sont fixés le long de l'épine. Les testicules et les ovaires sont doubles; les premiers prennent le nom de *laites.* Presque tous les poissons osseux ont une vessie aérienne, dont toutes les fonctions ne sont pas bien connues, mais qui est pourvue d'une membrane musculaire, pour diminuer, au besoin, le volume du corps dans l'acte de la natation. La plupart des poissons n'ont pas d'accouplement.

Ce qui vient d'être dit présente quelques exceptions ou modifications chez les chondroptérygiens, qui, l'ossification à part, sont supérieurs dans la série animale. (1)

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[1] Dans les divisions qui viennent à la suite du tableau ci-joint, j'ai souvent profité des travaux de Mr. Gill. J'ai consulté aussi, entr'autres matériaux, l'article de J. Müller, inséré dans Wiegmann's Archiv. I., p. 292. Quant aux caractères génériques, il faut avouer que les auteurs les plus renommés n'en ont employé qu'un nombre bien borné, et en ont négligé plusieurs de première importance. Ce reproche ne s'adresse pas à Mr. Gill, qui a donné l'exemple de diagnoses génériques plus étendues: c'est sous cette impulsion que je présente les miennes.—Quant à la nomenclature des os, j'ai adopté celle de Mr. Richard Owen.

CLASSIFICATIO PISCIUM VIVENTIUM

ex Artedi, Linné, Cuvier, Agassiz, Müller, Owen, Bonaparte, C. Duméril, Bleeker, Gill, Poey.

Subclassis.	*Sectio.*	*Ordo.*	*Subordo.*	*Series.*	*Familiæ, v. g.*
Teleostei, M	Teleocephali, Gill.	Acanthopteri, Art.	choripharyngodontes, Blk	thoracici	Percidæ.
				abdominales	Sphyrænidæ.
			amphipharyngodontes, P		Malacanthidi.
		Sympharyngodontes, Blk.	acanthopterygii	ctenoidei	Pomacentridi.
				cycloidei	Scaridi.
			malacopterygii		Scombresocidi.
		Subacanthopteri, P.	Gobiosomi, P	thoracici	Gobidi.
				jugulares	Blennidi.
			Pediculati, L		Lophidi.
			Jugulati, L.		Gadidi.
			Heterosomi, D		Pleuronectidi.
		Malacopteri, Art.	Abdominales, C		Cyprinidi.
	Ateleocephali, P.	Apodes, L.			Murænidæ.
		Nematognathi, Gill			Siluridi.
		Plectognathi, C.	Gymnodonti, C		Diodontidi.
			Sclerodermi, C		Balistidi.
		Lophobranchii, C			Hippocampidi.
Ganoidei, Ag.		Holostei, M.			Lepidosteidi.
		Chondrostei, M.			Acipenseridi.
Protopteri, Ow					Lepidosirenidæ.
Elasmobranchii, Bon.		Plagiostomi. D	Pleurotremi, D		Squalidi.
			Hypotremi, D		Rajidæ.
		Holocephali, M			Chimæridæ.
Dermopteri, Ow		Cyclostomi, D	Hyperoartii, M		Petromyzontidi.
			Hyperotreti, M		Myxinidæ.
		Leptocardii, M			Amphioxidi.

1. Les *Sympharyngodontes* de Bleeker sont les *Pharyngognathi* de Müller.

2. Müller place la famille des Chromides parmi les Pharyngognathes; cependant, le *Nandopsis tetracanthus* de Cuba, a les os pharyngiens inférieurs unis seulement en apparence; car ils se séparent avec un léger effort.

3. Je n'ai pas nommé avec Müller *Anacanthini* mon ordre des *Subacanthopteri*, parceque l'auteur limite cette dénomination aux *Gadidi*, *Pleuronectidi*, *Ophididi*.

4. Je ne me suis pas occupé des *Leptocephali* de Bonaparte, ou *Lemniscati* de Kaup, parcequ'on ignore encore si ce sont des poissons adultes, ou des embryons.

SUBCLASSIS I.—TELEOSTEI.

Le nom de cette sous-classe est dû à Müller en 1845; il fait allusion à l'ossification plus ou moins parfaite du squelette. Elle répond aux poissons osseux de Cuvier, sauf les Lépidostéïdes.

Branchies libres sur leur contour; ouverture branchiale simple de chaque côté, et placée au-devant des pectorales.

Nerfs optiques croisés; deux valvules opposées à l'entrée du bulbe aortique.

Corps écailleux; les écailles sont ctenoïdes ou cycloïdes.

Sectio 1.—TELEOCEPHALI.

Le nom indique que la tête est parfaite. Cette coupe était nécessaire, et sa dénomination est due à Mr. Gill, qui l'a appliquée à un ordre. Elle embrasse les Acanthoptérygiens de Cuvier, ainsi que ses Malacoptérygiens abdominaux et subbrachiens, excepté les Silurides. Les maxillaires et les prémaxillaires existent séparément, ainsi que les sous-orbitaires; l'os sous-operculaire existe, sauf chez les Notoptérides. Branchies pectinées.

Ordo 1.—ACANTHOPTERI.

Une partie des rayons dorsaux et quelques-uns de l'anale sont épineux, simples, non-articulés, ainsi que le premier de la ventrale. Arcs branchiaux au nombre de quatre, portant les branchies entières, à double lame suivies d'une fissure, et ordinairement une fausse-branchie. Des appendices pyloriques à la branche montante de l'estomac. Vessie aérienne sans conduit pneumatique.

Subordo 1.—CHORIPHARYNGODONTES.

Os pharyngiens inférieurs séparés.

Series 1.—THORACICI.

Os pelvien en relation avec l'arcade scapulaire: ventrales thoraciques.

Familia 1.—PERCIDÆ.

Corps plus ou moins allongé; anus arrièré. Ventrales 1, 5. Sept rayons aux branchies; ouverture branchiale bien fendue; la fausse-branchie existe, excepté dans les genres *Lates* et *Gni-*

don. Quelques pièces operculaires épineuses ou à bords dentelés, excepté chez les Apsiles. Yeux latéraux; ouvertures nasales doubles de chaque côté, l'antérieure à bord tubulaire, la postérieure simple. Bouche fendue à l'extrémité du museau; régime carnivore; mâchoires plus ou moins protractiles. Dents en velours, le plus souvent accompagnées d'un rang externe de dents pointues, plus fortes et solides, avec ou sans canines. Dents au vomer et aux palatins. Une ou deux dorsales, avec ou sans sillon sur le dos, pour loger les rayons épineux; la partie molle moins étendue que la partie épineuse; rayons mous branchus. Écailles cténoïdes: ligne latérale continue, finissant sur la base de la caudale. Joues non-cuirassées. Le conduit osseux semi-circulaire latéral de l'ouië commence sur l'alisphénoïde, pénètre dans le mastoïdien, et revient par l'exoccipital, après avoir traversé ces trois os; le conduit vertical postérieur traverse l'exoccipital, pénètre dans le paroccipital, et termine par une ouverture supérieure de ce dernier. C'est ce qui arrive chez les adultes; car dans les jeunes le canal membraneux latéral entre et sort par le mastoïdien, par des ouvertures rendues complètes au moyen d'une échancrure de l'alisphénoïde et de l'exoccipital; l'autre pénètre par une échancrure de l'exoccipital. Le pectoral osseux et tout-à-fait superficiel, n'entre pas dans la formation de la capsule auditive. La première névrapophyse chevauche, c'est-à-dire qu'elle est mobile sur la première vertèbre abdominale.

Vertèbres 10—14. Surtemporaux au nombre de deux. Appendices pyloriques généralement peu nombreux; intestins à deux replis, sauf quelques légères modifications. Vessie aérienne simple.

Observations.—Cette coupe répond à la famille des Percoïdes de Cuvier, Règne Animal, 2^e^ édition; sauf les genres qui ont plus ou moins de sept rayons aux branchies, et les sous-familles du Dr. Günther, Catalogue, I., p. 57, qui ont pour types les genres *Pentaceros*, *Apogon*, et *Grystes*. J'en ai détaché aussi les genres *Centropomus* et *Rhypticus*, comme types de familles distinctes; et les genres anomaux de Günther (l. c., p. 51), *Pogonoperca* et *Prionodes*, ainsi que mon genre *Gramma*, non moins anomal. Voyez les observations de Mr. Gill, Proc. Phil., 1861, p. 46.

Subfamilia 1.—SERRANINI.

Une seule dorsale, la partie épineuse non-logée dans un sillon du dos. Opercule épineux, préopercule dentelé. Un rang de dents extérieures, solides et plus fortes que les intérieures qui les accompagnent, et qui sont ordinairement couchées et mobiles. Des canines sur le devant des mâchoires. Le premier sous-orbitaire, peu développé, ne recouvre pas la partie postérieure du maxillaire, excepté dans le genre *Mentiperca*. Pectorale arrondie. Dernier rayon de la ventrale attaché à l'abdomen par une membrane axillaire. Il n'y a pas de lobule écailleux au-dessus de la base de la ventrale; mais il y a souvent une pli cutané écailleux au-dessus de l'axille pectorale. Les écailles sont petites; le limbe préoperculaire en est couvert. L'os surscapulaire ne perce pas en dehors. Le post-frontal, saillant et aplati en dessus, porte un os caverneux post-orbitaire solidement encaissé, faisant continuation à la chaîne d'osselets sous-orbitaires. La fosse paroccipito-mastoïdienne est plus ou moins profonde, couverte en partie par une côte parieto-mastoïdienne, excepté cependant dans le genre *Brachyrhinus*. Il y a un os labial, placé au-dessus du maxillaire. On ne trouve pas dans les chairs, au-devant de la première épine internévrale, les trois fausses internévrales qui se présentent chez les *Lutjanini;* tout au plus y voit-on dans les premiers groupes, un os de la nuque, incliné en sens contraire et moins ossifié.

Les deux derniers groupes de cette sous-famille, appartenant aux genres *Haliperca* et *Hypoplectrus*, forment une transition aux *Lutjanini*, par l'os surscapulaire visible en dehors, l'apophyse post-frontale sans osselet post-orbitaire, la fosse paroccipito-mastoïdienne limitée et non-recouverte, le défaut d'os labial et l'absence de fausses épines internévrales; mais ils appartiennent aux *Serranini* par tous les autres caractères, qui sont les plus importants. La caudale est échancrée. Le limbe préoperculaire est nu. Ils diffèrent encore de tous les Percides par la ventrale sans frein membraneux. On pourrait former de cette coupe la sous-famille des *Hypoplectrini*.

Voici dans quel ordre je place les genres de Cuba qui se ..sent dans ~~p ʇuəʌnoɹʇans~~ cette sous-famille.

a.

1. *Trisotropis.*—Species: *Cardinalis*, Val.—*petrosus*, Poey.—*brunneus*, Poey.—*Bonaci*, Poey.—171, Poey.—*Aguaji*, Poey. —*camelopardalis*, Poey.—429, Poey.—*tigris*, Val.—*calliurus*, Poey.—181, Poey.—*interstitialis*, Poey.—*chlorostomus*, Poey. —*dimidiatus*, Poey.—*falcatus*, Poey.

2. *Epinephelus.*—Species: *striatus*, Bl.—*morio*, Val.—*flavolimbatus*, Poey.—*niveatus*, Val.—*impetiginosus*, M. et Tr.—*lunulatus*, Bl.—*Cubanus*, Poey.

3. *Lioperca.*—Species: *inermis*, Val.

4. *Promicrops.*—Species: *Guasa*, Poey.

5. *Schistorus.*—Species: *mystacinus*, Poey.

6. *Prospinus.*—Species: *chloropterus*, Cuv.—712, Poey.

b.

7. *Brachyrhinus.*—Species: *furcifer*, Val.

c.

8. *Petrometopon.*—Species: *guttatus*, L.—*apiarus*, Poey.

9. *Enneacentrus.*—Species: *punctulatus*, Gm.—224, Poey.

10. *Menephorus.*—Species: *dubius*, Poey.—309, Poey.

d.

11. *Centropristis.*—Species: *Merus*, Poey.

e.

12. *Haliperca.*—Species: *Phœbe*, Poey.—*fuscula*, Poey.—*Jacome*, Poey.—*præstigiator*, Poey.—*bivittata*, Val.

13. *Diplectrum.*—Species: *radians*, Q. et G.

14. *Mentiperca.*—Species: *luciopercana*, Poey.

f.

15. *Hypoplectrus.*—Species : *puella*, Cuv.—*vitulinus*, Poey.—*indigo*, Poey.—*bovinus*, Poey.—*gummigutta*, Poey.—*guttavarius*, Poey.—*pinnavarius*, Poey.—*maculiferus*, Poey.—*aberrans*, Poey.—*nigricans*, Poey.—*accensus*, Poey.—*affinis*, Poey.

16. *Gonioplectrus.*—Species : *hispanus*, Cuv.

GENUS TRISOTROPIS.

Historique.—Ce genre a été établi par Mr. Gill, dans les Proceed. Acad. Philad., 1865, p. 104, dans la famille *Percidæ*, sous-famille *Serraninæ*. Voyez en entier cette description, dont le type est le *T. guttatus*, Gill ex Bloch, le même que le *Serranus cardinalis* de Valenciennes. C'est un démembrement du grand genre *Serranus* de Cuvier, appartenant à la division des *Mérous* de Cuv. et Val., et comprenant parmi ces derniers ceux qui joignent à onze piquants de la dorsale la caudale coupée carrément, et l'anale 3, 11.

Etymologie.—τρεῖς, tres ; τρόπις, carina.

Caractère du genre.—Corps oblong, œil haut ; ouvertures nasales rapprochées, plus près de l'oeil que du bout du museau. La bouche est très-fendue ; le maxillaire termine, dans les sujets de 12 pouces, sous le milieu de l'œil ; mais dans les grands sujets, il dépasse l'orbite. La mâchoire inférieure est beaucoup plus avancée que la supérieure. L'opercule a trois pointes ; celle du milieu bien saillante, la supérieure émoussée, l'inférieure peu visible en dehors. Le préopercule finement dentelé, arrondi, presque sans sinuosité, sauf dans le groupe qui porte le nom vulgaire de *Abadejo*, où l'angle inférieur se détache et porte quelques grosses pointes ; il n'est pas denticulé en dessous. La langue est pointue, lisse, retenue par un frein, logée en partie sous un voile membraneux.

Dents.—Il y a une dent canine, robuste, courte, au-devant de chaque mâchoire ; elle est suivie d'une rangée externe de dents coniques, aiguës, crochues, plus petites, solidement implantées.

En dedans, soit en arrière de cette première série, se trouve une bande de dents en cardes, grêles, aiguës, les antérieures en plus grand nombre et plus longues, toutes mobiles, ordinairement couchées ; celles de la mâchoire inférieure plus nombreuses. Les dents de la voûte palatine sont aussi en cardes ; celles du vomer, sur un chevron angulaire ; celles des palatins, sur une ligne étroite. Les os pharyngiens ont des dents en velours. Les arcs branchiaux ont de courtes râtelures et de gros tubercules hérissés d'épines.

Nageoires.—D. 11, 16 ; A. 3, 11. Le dernier rayon épineux de la dorsale est au moins aussi long que celui qui le précède, et rapproché du premier rayon mou ; la partie molle est notablement moins étendue que la partie épineuse. La caudale est coupée carrément, présentant souvent deux pointes très-peu saillantes; il est très-rare de la trouver légèrement arrondie vers les pointes, et je ne l'ai vue bien échancrée que chez le *T. falcatus.* Les épines anales ne sont pas fortes ; et il y a un repli cutané au-dessus de la base de la pectorale.

Ecailles.—Les écailles sont petites ; car leur nombre, sur la ligne latérale, passe ordinairement de 100 : elles doivent se ranger sous la division des Cténoïdes de Mr. Agassiz, à cause de l'éventail qu'elles ont toujours à leur racine ; mais leur bord libre, quoique ponctué, n'est pas toujours cilié ; il est souvent couvert par l'épiderme, ce qui empêche de les compter avec exactitude, et de les sentir sous les doigts. Celles de l'opercule sont un peu plus petites que celles du tronc ; celles du dessus de la tête et des joues sont encore plus petites ; il y en a sur le limbe du préopercule et sur l'interopercule ; celles qui s'étendent sur le bout du museau et sur la mâchoire inférieure sont très-petites ; et celles qui couvrent le maxillaire le sont a tel degré qu'on ne peut les distinguer qu'avec une forte loupe. La partie molle des nageoires verticales est en partie couverte par la peau, qui montre à la loupe de petites écailles ; il y en a même à la base des interstices que laissent entr'elles les épines dorsales. On trouve souvent, soit entre deux écailles, soit à la base d'une seule, de très-petites écailles, qui se montrent comme des tubercules microscopiques, formés par l'épiderme sous laquelle elles se cachent.

Squelette.—Crâne élargi en arrière. Espace interorbitaire large et enfoncé. La crête suroccipitale est basse, terminant postérieurement en angle obtus ; les autres crêtes sont hautes ; il n'y a pas de crête frontale. L'orbite est placé sur la moitié antérieure du crâne. L'apophyse préorbitaire est tres-saillante, et portant la tête qui s'articule avec le premier sous-orbitaire ; l'apophyse post-orbitaire est très-prononcée. La lame antérieure de l'alisphénoïde avance beaucoup ; le trou postérieur qui donne passage au nerf trijumeau est très-arrièré. La convexité oto-cranienne ne se montre pas au dehors. La base esphénoïdale du crâne est droite ; la fosse paroccipito-mastoïdienne est profonde.

Voici comment Mr. Gill décrit le crâne : "Distinguished by the petrous-like convexity between the supra-orbital grooves, and its triangular sinus behind, into the angles on each side of which the lateral crests terminate ; the crests are parallel, and the surface between flat or scarcely convex."

Cinq sous-orbitaires et un osselet caverneux solidement encaissé sur l'apophyse post-orbitaire. Prétympanal pourvu d'une lame apophysaire plate. Les six premières vertèbres abdominales sans apophyses transverses, les deux dernières paires formant l'anneau. Les premières névrapophyses de la colonne vertébrale sont larges, courtes, plus obliques que les normales. Les côtes sont dans l'ordre suivant, de chaque côté : 2 épines épinévrales, 8 pleurapophyses, 7 épipleurales. La première épine internévrale ne porte qu'un seul aiguillon de la dorsale. Il n'y a pas sur le devant, entre les chairs, de fausses internévrales ; on y trouve seulement un osselet peu durci, sans tête épineuse, disposé obliquement en sens contraire, en arrière de la crête occipitale ; on pourrait le nommer l'os de la nuque. L'os pelvien n'a pas son apophyse interne ascendante.

Viscères.—L'intestin est ferme ; il revient deux fois sur lui-même, et se pelotonne avant le premier pli. Les cœcums sont au nombre de 12 à 18, ordinairement 15 ; ils sont longs et fermes. La vessie aérienne est à parois minces et transparentes. Il n'est pas rare de trouver au milieu des viscères des helminthes enkystés, bleuâtres à l'extérieur.

Couleurs.—Les couleurs, chez les espèces de Cuba, sont d'un fond violet, plus ou moins couvert de taches d'un brun rougeâtre : le rouge se présente parfois sur le fond du dos et sur les taches. Les nageoires verticales ont un fin liséré blanc, qui se perd avec l'âge.

Variétés.—Les changements apportés par l'âge ne se bornent pas à la petitesse de l'œil et au raccourcissement des nageoires ; mais encore aux couleurs du corps, et surtout à celle des nageoires pectorales, qui dans le premier âge sont presque d'une teinte uniforme, et plus tard bordées d'une manière tranchée d'orangé ou de blanc.

Histoire.—La plupart de ces poissons deviennent très-grands ; leur chair est bonne à manger. Ceux de grand taille sont suspects, parce que parfois et bien rarement ils ont été pêchés malades, et ont causé l'indisposition que dans le pays on nomme *ciguatera.*

GENUS EPINEPHELUS.

Historique.—Ce genre a été établi par Bloch, Ichthyologia, Pars 10, p. 9 ; abandonné par Cuvier et Valenciennes, rétabli par Mr. Gill, Proceed. Philad., 1862, pp. 236, 237 ; 1863, p. 80 ; dans la famille *Percidæ*, sous-famille *Serraninæ.* C'est un démembrement du grand genre *Serranus* de Cuvier, appartenant à la division des *Mérous* de Cuv. Val., et comprenant parmi ces derniers ceux qui joignent à onze piquants de la dorsale la caudale ordinairement arrondie, et les nombres de l'anale 3, 9 ; jamais plus, quelquefois 3, 8.

Etymologie.—ἐπινεφιλος, *obnubilus.*

Voici les caractères assignés par Bloch : "*Pisces capite toto squamoso, operculo anteriore serrato, posteriore aculeis* *armato;*" à quoi il ajoute une seule dorsale et des écailles ciliées. La première espèce décrite est le *E. afer*, dont il a fait plus tard le type de son genre *Alphestes*, et dont je m'occuperai au sujet du *Prospinus chloropterus:* ce type de Bloch a la caudale arrondie, et l'anale 3, 9.

Ce genre, négligé par Cuvier et Valenciennes, a été repris par Mr. Gill, qui y a ajouté un caractère remarquable, savoir, des dents en cardes et mobiles dans l'intérieur des mâchoires. En 1865, Proceed. Philad., p. 105, il l'a distingué du genre *Trisotropis* par la forme du crâne; et par le seul fait d'avoir accordé à ce dernier genre l'anale 3, 11, il a laissé dans le genre *Epinephelus* les espèces qui ont l'anale 3, 9; il n'a rien dit de la caudale, mais celle de *Trisotropis* n'est pas pour lui arrondie.

Bloch a nommé ces poissons Epinéphèles, parce que, dit-il, "ils ont les yeux couverts d'une membrane, ou d'une taie;" ce qui ferait croire qu'ils ont sur l'œil une membrane adipeuse. Tout au plus voit-on chez les adultes une prolongation de la paupière supérieure, qui est loin de pouvoir être nommée une taie. Le nom reposerait alors sur une erreur, et mériterait d'être changé. En ce cas le groupe *Mérou* de Cuv. Val., fixé par sa première espèce *Serranus gigas*, pourrait y être substitué, en Latin *Merus.* Quant aux Mérous de 9 épines dorsales, ils en ont été détachés par Mr. Gill, qui en a fait ses genres *Petrometopon* et *Enneacentrus.* Le genre *Cromileptes* de Swainson, Nat. Hist. of Fishes, &c., 11, pp. 168, 201, doit aller a la synonymie du genre *Epinephelus.*

Caractères du genre.—Pour être bref dans les caractères du genre, je me bornerai à dire qu'il a tous ceux qui ont été assignés au genre *Trisotropis*, sauf l'anale 3, 9, et la forme du crâne; la caudale est ordinairement arrondie. Le crâne est étroit entre les deux orbites; la crête mastoïdienne forme un arc descendant. La langue n'est pas toujours si pointue. Les écailles du tronc sont ciliées et découvertes, sans mélange d'autres plus petites; les nageoires verticales n'ont pas toujours un liseré, et portent quelquefois une lanière vers les pointes épineuses de la dorsale. La vessie natatoire est à parois minces, mais ordinairement renforcée sur sa partie antérieure; le nombre des cœcums varie, mais il n'est pas très-considérable. La chair est toujours saine.

GENUS LIOPERCA.

Historique.—Ce genre a été établi par Mr. Gill en 1862, dans les Proceed. Philad., pp. 236, 237, famille *Percidæ* sous-famille *Serraninæ.* Il se trouve dans la division de: "Dorsale entière ou presque entière, caudale entière ou simplement échancrée; corps oblong, écailles petites; dents non-couchées en arrière des canines; écailles douces au tact et glissantes; onze rayons épineux à la dorsale; type: *Serranus inermis* C. et V.—L'auteur dit en 1865, dans le même ouvrage, p. 105: "que les genres de cette sous-famille établis par lui pour les espèces des Indes occidentales, peuvent se distinguer par la forme du crâne, même le genre *Lioperca,* qui offre cependant le plus de doutes."

Etymologie.—λεῖος, *lævis; Perca,* nom propre. Ce qui peut-être fait allusion à la faiblesse des pointes operculaires.

Caractères du genre.—Corps oblong, mâchoires à-peu-près d'égale longueur. Trois pointes à l'opercule; celle du milieu forte, les autres plates. Préopercule finement dentelé à la branche montante, fortement à l'angle, nullement au bord inférieur. Narines rapprochées de l'œil. Langue lisse, libre et pointue.

Dents.—Les dents des mâchoires sont en cardes; les plus intérieures, quoique petites, sont mobiles, et il y en a quelques-unes de plus grandes sur le devant; les canines ne sont bien remarquables que dans un âge avancé. Les dents du vomer et des palatins sont en cardes, sur un seul chevron.

Nageoires.—D. 11, 19; A. 3, 9. La partie molle de la dorsale est très-élevée; la caudale arrondie, excepté dans un âge fort avancé.

Écailles.—Environ 100 sur une ligne longitudinale; celles de la joue très petites; il y en a sur toutes les pièces operculaires et sous le dentaire. Il n'y en a pas sur les apophyses montantes du prémaxillaire, sur le devant de l'œil, ni sur le maxillaire. Il y en a sur la base de toutes les nageoires, principalement sur les verticales médianes, qui sont couvertes d'une peau épaisse.

Squelette.—Le crâne est étroit postérieurement, ainsi que l'espace interorbitaire; la crête suroccipitale peu relevée, se continuant avec une crête frontale très basse et courte; la mastoïdienne est descendante. L'orbite est avancé, les apophyses orbitaires saillantes; le trou du nerf trijumeau arrièré; la convexité otocranienne nulle en dehors; la base esphenoïdale un peu courbe. Sous-orbitaires au nombre de 4, sans compter l'osselet solidement encaissé sur l'apophyse post-orbitaire; prétympanal pourvu d'une apophyse laminaire. Les apophyses latérales des vertèbres abdominales commencent sur la 6e et vont en augmentant, les deux dernières paires formant l'anneau. Les premières névrapophyses forment un arc renforcé sur le devant; 2 épines épicentrales antérieures, 8 pleurapophyses, 6 épipleurales (peut-être 8). Le premier internévral ne soutient qu'une seule épine du dos; il n'y a pas sur le devant de fausses épines internévrales.

Viscères.—Estomac court, branche montante très-courte; cœcums assez nombreux, divisés, les divisions sont dans le type au nombre de 60. L'intestin est très-ferme et très-grêle, faisant les circonvolutions ordinaires, mais se pelotonnant un peu avant le premier pli. Vessie aérienne à parois minces et transparentes.

Observations.—J'ai adopté ce genre dans ma Synopsis, en 1868, par déférence pour l'opinion de Mr. Gill, en qui j'ai toujours reconnu un tact sûr, soit un don particulier pour la classification. Un des caractères par lui donnés, a cependant disparu ici; c'est celui qui se fonde sur l'absence de dents couchées en arrière des canines: on voit que les mâchoires sont armées dans le sens de celles de *Trisotropis;* ce n'est qu'une question de plus ou de moins entre les deux genres. C'est peut-être moi qui ai induit en erreur Mr. Gill; car en 1851, époque à laquelle j'ai décrit l'espèce-type dans mes Mémoires, je n'avais pas encore les connaissances que j'ai retirées plus tard de mes études et des savants articles de l'ichthyologiste américain, mon digne correspondant durant le cours de plusieurs années; et j'ai commis alors quelques erreurs: ainsi, je me suis trompé en écrivant que les dents sont en velours ras; ce qui ne peut paraître ainsi que chez de jeunes individus; et que la crête suroccipitale est haute.

Tel qu'il est, le genre *Lioperca* peut être séparé de *Trisotropis* et de *Epinephelus* par un corps un peu bossu, à cause de l'affaissement de la tête, la peau plus mucilagineuse, deux épines plates qui accompagnent une épine plus robuste de l'opercule, bout du museau dépourvu d'écailles, sauf le dentaire; cœcums nombreux et divisés, défaut complet de fausses épines internévrales. Une autre particularité bien remarquable est celle que l'âge introduit dans la forme des nageoires verticales, surtout dans la caudale, qui, d'abord arrondie, devient dans l'âge adulte légèrement échancrée.

GENUS PROMICROPS.

Historique.—Ce genre a été établi par Mr. Gill, qui n'en a pas encore donné au public les caractères; mais il a eu la bonté de me l'indiquer avant l'impression de ma Synopsis, ayant pris pour type le *Serranus Guasa* de mes Mémoires.

Etymologie.—Je crois que le nom se rapporte à la brièveté de la partie antérieure du crâne; ce qui est dû au grand avancement de l'orbite.

Caractères du genre.—Ce genre a les caractères des *Epinepheli*, sauf le crâne, qui se rapporte à celui des *Trisotropi* par la grande distance interorbitaire. On y remarque l'œil très-avancé, et le trou du nerf trijumeau très-arriéré. Il en diffère de plus par les dents et par l'extrême division des appendices pyloriques.

Les dents sont en cardes sur une large bande, un peu plus étroite à la mâchoire inférieure; le bord externe offre une rangée de dents un peu plus fortes, surtout les deux premières, mais on ne voit pas s'y détacher de vraies canines; la rangée tout-à-fait interne, sur le devant, offre aussi quelques dents plus fortes. La bande des palatins et le chevron du vomer sont en cardes plus fines. Les cœcums et leurs divisions sont innombrables.

GENUS SCHISTORUS.

Historique.—Genre établi par Mr. Gill, Proceed. Philad., 1862, pp. 236, 237, où il en donne les caractères suivants, servant à le distinguer des autres genres de Cuba: "Famille des *Percidæ*, sous-famille *Serraninæ;* une seule dorsale sans échancrure, caudale entière, corps oblong, écailles petites, des dents couchées derrière les canines, préopercule ayant vers le bas des épines tournées en avant; D. 11, 14; cœcums nombreux et divisés." Type: *Serranus mystacinus*, Poey.

Caractères du genre.—Je crois qu'il faut faire peu d'attention aux pointes de l'angle du préopercule, telles que les présente cette espèce, lesquelles sont peu nombreuses et variables; ce qui, outre la taille et la dentition, l'éloigne du groupe des *Plectropomæ.* Laissant à part ce faible caractère, tout ce que m'a appris l'étude de cette espèce, n'ayant pas examiné le squelette, en fait un véritable *Epinephelus*, avec la seule différence que présentent les appendices pyloriques. J'ai indiqué ce dernier caractère, bien mieux prononcé chez le *Promicrops Guasa;* et on le retrouve, tel que le présente le *Schistorus mystacinus*, chez le *Epinephelus niveatus* et chez le *Lioperca inermis.* L'étude du crâne peut seule nous dire si le genre doit être conservé, ou s'il faut le considérer comme un

Epinephelus ou comme un *Promicrops.* Mon respect pour l'opinion de Mr. Gill m'a fait adopter son genre dans ma Synopsis, en 1868.

Etymologie.—σχίζω, diviser; ὀρος, humeurs. Par allusion aux cœcums.

GENUS PROSPINUS.

Historique.—Les auteurs du genre *Plectropomus* (Cuv. et Val., Poiss., II., p. 387) ont eux-mêmes qualifié de fort léger le caractère tiré de la dentelure autour et au-dessous de l'angle préoperculaire. C'est cependant sur les modifications de ce caractère qu'ont été fondés, parmi les *Percidæ*, sous-famille des *Serranini*, plusieurs genres, qui ne mériteraient pas d'être conservés, si l'on n'avait pas trouvé à leur appui quelques autres particularités plus importantes.

Le genre *Plectropomus* est de 1828 : il a été subdivisé en trois groupes, selon le nombre de dentelures, et le bord montant du préopercule entier ou finement dentelé. La première espèce nommée, et qui doit par conséquent servir de type dans le premier groupe, est le *Bodianus melanoleucus* de Lacépède. Le corps est allongé. Le bord montant du préopercule est entier; D. 8, 11; A. 2, 8. Les écailles sont petites; il y en a sur le bout du museau, sur le maxillaire, sur les nageoires; les pectorales sont arrondies, la caudale à-peu-près coupée carrément.

Le genre *Hypothrodus* (on lit *Hyporthodus*, mais je crois que c'est une faute d'impression) a été établi par Mr. Gill, Proc. Phil., Mai de 1861, p. 98. Type: *H. flavicauda*, Gill. L'opercule, la joue, les os surmaxillaires sont couverts d'écailles, la mâchoire inférieure nue. Le préopercule porte à l'angle une forte épine, elle-même denticulée, aussi que le bord montant; il y a encore des dentelures au bord inférieur. D. 11, 14; A. 3, 10.

Le genre *Prospinus* a été nommé dans mes Mémoires, I. p.

364. Type: *Pl. chloropterum* C. V., fondé, p. 388, sur la force et le petit nombre de dents sous-préoperculaires. Il a été adopté par Mr. Gill, Proc. Acad. Phil., 1862, pp. 236, 237, dans la division de "Dorsale entière ou presque entière, caudale entière ou simplement échancrée, corps oblong, écailles petites, dents couchées en arrière des canines, préopercule pourvu en dessous d'une ou de deux pointes dirigées en avant; D. 11, 18–19. Cœcums 8."

Le genre *Alphestes* de Bloch, Systema, p. 236, en 1801, ayant pour type le *Epinephelus afer* de Bl., Ichth., tab. 327, lequel est le même que le *Pl. chloropterum* de C. et V., a la priorité sur le genre *Prospinus;* mais je crois qu'il doit tomber: 1°. parce qu'il n'est pas fondé sur l'épine préoperculaire, que l'auteur n'a pas aperçue; 2°. parce que le caractère donné a une étendue trop-considérable, savoir: *Squamæ operculi posterioris duplo majores quam anterioris.* C'est tout ce qu'il en dit; et c'est ce qui pourrait être appliqué à une foule de genres.

Le genre *Acanthistius* a été proposé par Mr. Gill, Proc. Acad. Phil., 1862, p. 236, pour le *Pl. serratum*, Cuv. et Val., qui doit servir de type. Cette espèce, placée dans le 2ᵉ groupe de C. et V., a le corps gros et court, les deux mâchoires d'égale longueur, des écailles au maxillaire et à la mâchoire inférieure; préopercule fortement dentelé; et près de l'angle, deux grosses dents dirigées en avant, dont l'antérieure plus forte. D. 13, 16; A. 3, 9. Ecailles petites.

Le genre *Hypoplectrodes* a été proposé par Mr. Gill, Proceed. Acad. Phil., 1862, p. 236, pour le *Pl. nigro-rubrum*, C. et V. Il est plus allongé que le *Pl. serratum;* les dentelures du bord montant du préopercule sont plus fines; il n'y a au bord inférieur que deux pointes dirigées en avant, dont l'une à l'angle. D. 10, 17; A. 3, 8.

Genre *Gonioplectrus*, Gill.—Voyez ci-dessous.

Genre *Hypoplectrus*, Gill.—Voyez ci-dessous.

Genre *Schistorus*, Gill.—Voyez ci-devant.

Etymologie.—Prospinus, épine tournée en avant.

Caractère du genre Prospinus.—Il diffère du genre *Epinephelus* par l'épine préoperculaire et quelques menus détails : ainsi, les canines sont très-petites ; on n'en voit pas à la mâchoire inférieure. La ligne latérale porte 70 écailles ; celles de l'opercule sont grandes ; elles sont petites sur les joues ; il y en a sur l'espace interorbitaire et sur l'os turbinal, mais non pas sur le bout du museau ni sur le maxillaire. L'épine unique sous-préoperculaire est très-forte, couverte dans le frais par la peau : elle paraît elle-même finement subdivisée en arrière, parce qu'elle porte la terminaison de la roue formée par l'angle.

GENUS BRACHYRHINUS.

Historique.—Ce genre a été établi par Mr. Gill, dans les Proced. Acad. Philad., 1862, p. 236, dans la famille des *Percidæ*, sous-famille *Serraninæ ;* type, *Serranus creolus*, C. et V. Il y est placé dans la division de "Dorsale entière ou presque entière ; caudale bifurquée, à lobes aigus ; dorsale basse et uniforme ; formule radiale 9, 18–19." C'est pour Cuvier et Valenciennes un Serran du groupe des *Anthias.* J'ai adopté ce genre dans ma Synopsis, en 1868. Plus tard, Mr. Guichenot, dans un travail intitulé *Index Generum et Specierum Anthiadidorum*, inséré dans le 9ᵉ volume des Annales de la Société Linnéenne de Maine et Loire, a fait de l'espèce que je viens de citer le type de son genre *Paranthias*, dont il a donné les caractères suivants : "Corpus oblongum subelongatum, squamis minimis vestitum. Caput breve curvatum, omninò squamosum. Præoperculum tantum denticulatum. Oculi parvi. Pinna dorsi simplex absque incisa, simul ac analis et caudalis in parte squamosa."

Etymologie.—βραχὺς, brevis; ῥὶν, nasus.

Caractères du genre.—Corps élégamment oblong, museau court, œil médiocre ; narines rapprochées, occupant le milieu entre l'œil et le prémaxillaire ; préopercule finement dentelé, sinueux vers le bas; opercule à trois pointes, l'inférieure presque aussi forte que celle du milieu; bouche petite, mâchoire inférieure un peu plus avancée que la supérieure. Langue lisse.

Dents.—Les dents des mâchoires sont courtes et pointues sur un rang extérieur, précédées de deux canines petites et fortes; à l'intérieur il y a une bande de petites dents en cardes, très-étroite à la mâchoire inférieure. Celles du vomer sont sur une plaque triangulaire, et celles des palatins forment une plaque âpre. Les dents pharyngiennes supérieures sont en cardes, les inférieures en velours. Le premier arc porte de longues râtelures.

Nageoires.—D. 9, 19; A. 3, 9. La partie molle de la dorsale est plus basse que l'épineuse, et moins étendue; les épines anales sont courtes, mais fortes; la pectorale est arrondie, formant cependant un prolongement aigu; caudale bifurquée; ventrale retenue par une membrane axillaire. Le dernier rayon des nageoires médianes est filamenteux.

Ecailles.—Environ 115 le long de la ligne latérale, qui a sa direction normale. Il y en a sur toute la tête, excepté aux lèvres, ainsi que sur les nageoires. Le préopercule n'a pas son limbe nu. Il n'y a pas de lame surscapulaire.

Squelette.—Le crâne est aplati en dessus, concave dans l'espace interorbitaire, qui est assez large; l'orbite est rejeté vers l'extrémité antérieure; la crête suroccipitale est basse, arrondie, et peu prolongée en arrière; la paroccipitale est sinueuse; la fosse paroccipito-mastoïdienne est ouverte antérieurement; le basi-occipital offre une ample ouverture qui conduit à la fosse sous-cranienne. Sous-orbitaires au nombre de quatre? Nul osselet solidement encaissé sur l'apophyse post-orbitaire. Prétympanal portant une lame apophysaire. Les apophyses latérales abdominales commencent a la 5ᵉ vertèbre, les deux dernières paires formant l'anneau. Les deux avant-premières névrapophyses sont courtes, fortes, et peu inclinées. Il paraît que l'appareil des côtes se compose de 2 épines épinévrales, 8 pleurapophyses, 7 épipleurales. Le 1ᵉʳ internévral soutient une seule épine du dos ; il y a sur le devant deux, peut-être trois fausses internévrales. L'os pelvien n'a pas d'apophyse interne ascendante.

Viscères.—Cœcums, 8.

Genus Petrometopon.

Historique.—Ce genre a été établi par Mr. Gill, dans les Proceed. Acad. Philad., 1865, p. 105, sur le nombre des épines dorsales et la construction du crâne, famille des *Percidæ*, sous-famille *Serraninæ ;* ayant proposé pour type le *Perca guttata* de Linné, soit le *Serranus coronatus* de Valenciennes. En 1862, p. 236 du même ouvrage, il l'avait placé dans le genre *Bodianus* de Bloch ; mais en 1865, il a laissé ce dernier dans les *Labridæ*, type *Bodianus bodianus* de Bloch, soit le *Labrus rufus* de Linné. J'ai adopté ce genre dans ma Synopsis, en 1868. C'est un démembrement du genre *Serranus* de Cuvier, groupe des *Mérous*, dont il se distingue principalement par les neuf aiguillons de sa nageoire dorsale.

Etymologie.—πετρὰ, petra ; μέτωπον, frons ; à cause de l'endurcissement du crâne sur la partie frontale.

Caractères du genre.—Corps oblong. Narines rapprochées, placées près de l'œil. Préopercule dentelé sur le bord postérieur seulement ; opercules à trois pointes épineuses. Mâchoire inférieure plus avancée que la supérieure.

Dents.—Les mâchoires ont une rangée extérieures de petites dents aiguës, précédées d'une ou deux petites canines. La mâchoire supérieure a, derrière cette rangée, une bande d'aspérités ; mais sur le devant il y a un groupe de dents en cardes, les plus internes très-longues et grêles, couchées et mobiles. La mâchoire inférieure porte derrière la rangée externe une bande de dents en cardes, fines et allongées, également couchées et mobiles. Le vomer porte un chevron triangulaire de petites dents, et les palatins un mince chevron. La langue est lisse. Les dents pharyngiennes sont en velours.

Nageoires.—D. 9, 14 ; A. 3, 8. La dernière épine dorsale est égale à celle qui la précède. La partie molle de la dorsale a presque autant d'étendue que la partie épineuse. Les épines de l'anale sont fortes. La caudale est arrondie. La ventrale est retenue par une membrane axillaire.

Ecailles.—La ligne latérale est arquée. Les écailles sont ciliées, petites, environ 70 sur une ligne longitudinale ; celles de la joue sont petites. Il y en a de très-petites sur toute la tête, même sur le maxillaire, et sur la base des nageoires verticales. Un espace anteorbitaire qui conduit aux narines est cependant nu. Le surscapulaire ne perce pas en dehors.

Squelette.—Le crâne a peu de largeur en arrière ; l'espace interorbitaire endurci, étroit, et convexe ; la crête suroccipitale très-basse, et les autres aussi. L'orbite est placé sur la partie antérieure. La fosse paroccipito-mastoïdienne est profonde ; les apophyses articulaires préfrontales sont verticales. Les sous-orbitaires sont au nombre de cinq, et de plus il y a un osselet caverneux solidement encaissé dans l'apophyse post-orbitaire. Le prétympanal a une apophyse laminaire. Les six premières vertèbres abdominales n'ont pas d'apophyses latérales, les trois dernières paires formant l'anneau. Les premières névrapophyses sont robustes, dont les deux dernières moins longues. On compte 2 épines épinévrales, 8 pleûrapophyses, 7 épipleurales, dont la dernière est plutôt une épinévrale. Le premier internévral soutient une seule épine dorsale. L'os pelvien n'a pas d'apophyse ascendante.

Viscères.—Circonvolutions ordinaires, intestin grêle, un peu pelotonné avant le premier pli ; cœcums médiocrement nombreux, longs, fermes. Vessie aérienne très-solide.

Histoire.—Ce sont des poissons de mer, carnivores, de taille médiocre ; ceux de Cuba se distinguent par un fond rougeâtre parsemé de taches brunes ; trois taches brunes le long du dos, de chaque côté.

GENUS ENNEACENTRUS.

Historique.—Ce genre a été établi par Mr. Gill, dans les Proceed. Acad. Philad., 1865, p. 105, conjointement avec le genre *Enneacentrus*, sur le nombre des épines dorsales et de la construction du crâne; famille des *Percidæ*, sous-famille *Serraninæ ;* ayant pour type le *Serranus Ouatalibi* de Valenciennes, soit la variété rouge du *Perca punctulata* de Gmelin. J'ai adopté ce genre dans ma Synopsis en 1868. Il appartient au même groupe que le genre antérieur.

Etymologie.—*ἐννέα*, novem ; *κέντρον*, aculeus.

Caractères du genre.—Ce sont tous les caractères du genre *Pétrométopon*, sauf ceux du crâne, qui diffère en ce qu'il est cannelé dans l'espace interorbitaire, et toute sa surface lisse, comme Mr. Gill, habile observateur des crânes, l'a déjà fait remarquer. Le besoin de traduire au-dehors cette distinction anatomique, m'oblige d'ajouter un caractère tiré des couleurs : c'est, pour Cuba, deux taches noires surcaudales, et une autre, de chaque côté, sur l'extrémité de la mâchoire inférieure. J'ai trouvé dans le type un petit nombre de cœcums, dépassant 5, et la vessie aérienne à parois minces. Les mœurs et la taille sont ceux des Pétrométopons.

GENUS MENEPHORUS.

Le genre *Menephorus* ne diffère du genre *Enneacentrus* de Mr. Gill, que par la caudale coupée en croissant, et le défaut de taches noires sur le pédicule caudal et à l'extrémité du menton ; il porte, comme le genre établi par Mr. Gill, des points bleus sur le corps. L'importance du premier de ces deux caractères n'a pas été méconnu du savant classificateur que je viens de nommer; car il l'a fait heureusement entrer dans la description de ses genres. Il est certain que la caudale des *Trisotropis* se présente coupée carrément; celle des *Epinepheli* est arrondie ; celle des *Lutjani* est échancrée; celle des *Caran-*

gidæ est bifurquée. Cependant, je n'ignore pas qu'il y a en cela de rares exceptions, comme par exemple chez mon *Trisotropis falcatus* et chez le *Epinephelus morio ;* et je n'aurais pas sur ce seul caractère établi un nouveau genre dans la coupe de Mr. Gill, si je n'avais pas été appuyé par un trait de coloration caractéristique qui se trouve chez les *Enneacentri*, et qui manque dans les deux espèces du genre que j'établis ici.

Quant au caractère de coloration, il paraît nul au premier abord, quand on considère que l'organisation entière n'est nullement changée par la disposition des couleurs; mais d'un autre côté, on observe que la nature est souvent constante dans sa manière de peindre les animaux, suivant les groupes auxquels ils appartiennent. Ainsi, les espèces de la race féline ont en général le poil fauve, parsemé de taches arrondies; les Colibris, parmi les oiseaux, ont le gosier aussi resplendissant que les pierres précieuses ; les Buprestes, parmi les Coléoptères, sont couverts d'or ; les Papillons du genre Coliade sont presque tous jaunes, et les Piérides, blanches ; les Satyres dérobent aux herbes des bois montagneux leurs traits cendrés et incertains. Hübner a étrangément abusé de ce caractère dans sa classification lépidoptérique ; mais il n'en a pas été moins conduit à faire d'heureux rapprochements. Les couleurs souvent n'amènent à rien ; mais dans certains groupes elles semblent devoir faire nécessairement partie des descriptions génériques ; ne fut-ce qu'au dernier terme.

Je prends pour type le *Enneacentrus dubius* de mes Mémoires.

Etymologie.—μήνη, luna ; φέρω, fero. Ce qui répond au mot latin *Lunifer*, la caudale étant coupée en croissant.

GENUS CENTROPRISTIS.

Ce genre a été établi par Cuvier et Valenciennes, en 1829, dans l'Histoire des Poissons, III., p. 36, sous le nom de *Centropristes*. Dans le 2e volume du Règne animal, qui est postérieur, quoique de la même année, il a été changé en *Centropristis*, qui est plus acceptable.

D'après les auteurs du genre, ils sont parmi les Perches à dorsale unique et à dents en velours, à peu-près ce que sont les Serrans dans la division de dents canines, c'est-à-dire, qu'ils réunissent à un opercule épineux un préopercule dentelé en scie. Le museau, la mâchoire et la membrane des ouiës manquent d'écailles; mais il y en a sur le crâne, sur la joue, et sur les pièces operculaires. Type: *Perca atraria*, L.

Le type nommé, a les dents en velours, la langue lisse; D. 10, 11; A. 3, 7. La caudale est trilobée; mais la forme de cette nageoire n'entre pas dans les caractères du genre, tel que le présentent Cuv. et Val.

Le Dr. Günther, Catal. I., p. 82, indique les dents en velours, avec de très-petites canines aux deux mâchoires. Il ajoute que les dents du vomer sont sur une plaque triangulaire et que les nombres sont: D. 10, 12 (ou moins de 12); A. 3, 7 (parfois 6). Presque toutes les espèces citées dans dans cette partie de son catalogue, ont été plus tard portées par Mr. Gill à un nouveau genre, nommé par lui *Haliperca*.

Etymologie.—κέντρον, aculeus; πριστὸς, serratus.

GENUS HALIPERCA.

Historique.—Ce genre a été établi par Mr. Gill, dans les Proceed. Acad. Philad., 1862, p. 236, parmi les *Percidæ*, sous-famille *Serraninæ;* type, *Serranus bivittatus*, C. et V., *S. Phœbe*, Poey, *Centropristis tabacarius*, C. V., &ª. Il est placé dans la division de " Dorsale entière ou presque entière, caudale entière ou simplement échancrée, corps délié, écailles modérées (50–75) dents non couchées, mâchoires égales, préopercule dentelé." Les espèces de ce genre ont été distribuées par Cuvier et Valenciennes parmi les Serrans proprement dits et les Centropristes. C'est dans ces derniers qu'elles ont été placées par le Dr. Günther. Klein, Miss. V., p. 60, Nº. 4, a placé une de nos espèces dans son genre *Prochilus*, dépourvu de dents, qualifié de monstrueux par Cuvier et Valenciennes.

Etymologie.—ἅλς, mare ; πέρκη, perche.

Caractères du genre.—Corps allongé, tête obtuse en dessus, œil médiocre, ouvertures nasales rapprochées et placées près de l'œil ; préopercule dentelé sur tous ses bords, opercules à trois épines rejetées en bas ; bouche grande, mâchoire inférieure dépassant la supérieure. Langue lisse, libre, pointue. Voyez ce qui a été indiqué dans la sous-famille des *Serranini.*

Dents.—Les mâchoires ont un rang extérieur de dents pointues, dont les deux ou trois premières en haut, une ou deux en bas, sont plus fortes et peuvent être considérées comme canines ; en dedans, il y a en haut une bande de dents en velours, ainsi que sur le devant de la mâchoire inférieure. Parmi celles de devant de la mâchoire supérieure, il y en a une de chaque côté longue et forte, couchée en arrière, et qui paraît être mobile. Au milieu du rang externe de la mâchoire inférieure, s'élèvent environ cinq dents plus longues que les autres et écartées. Les dents du vomer sont sur un chevron triangulaire, et celles des palatins sur une bande étroite.

Nageoires.—D. 10, 12 ; A. 3, 7. La dernière épine dorsale est égale à l'avant-dernière. La partie molle est à-peu-près aussi étendue que la partie épineuse. La caudale est échancrée. Il n'y a pas de lanières à la pointe des épines dorsales.

Ecailles.—Les écailles sont au nombre de 50 à 70 le long de la ligne latérale, laquelle est parallèle au dos. Celles des joues sont égales ou presque aussi grandes que celles de l'opercule ; tantôt il y en a, tantôt il n'y en a pas sur l'interopercule, dont le limbe est toujours nu ; le crâne et tout le museau en est dépourvu ; il y en a à la base des nageoires verticales.

Squelette.—Le crâne est arrondi en-dessus ; les crêtes courtes et basses, la suroccipitale rejetée en arrière ; l'espace interorbitaire étroit ; une apophyse laminaire au prétympanal. Les apophyses latérales des vertèbres abdominales commencent à la 5^e, les trois dernières paires formant l'anneau. La 1^e et la 2^e névrapophyses sont fortes et courbent leur pointe en avant. La 1° épine internévrale soutient deux rayons de la dorsale; 2 épines épicentrales, 8 pleurapophyses, 7 épipleurales.

Viscères.—L'intestin est mou, les cœcums au nombre de 5, la vessie aérienne à parois minces et transparentes.

Histoire.—On en connait plusieurs espèces, toutes de petite taille.

GENUS DIPLECTRUM.

Historique.—Ce genre a été établi en 1855, par le Dr. Holbrook, dans son *Ichthyology of South Carolina*, p. 32. Type : *Serranus fascicularis*, Cuv. et Val. Il a été accepté par Mr. Gill, Proceed. Acad. Philad., 1862, pp. 236, 237.

Caractères.—Il ne diffère du genre *Haliperca* que par le préopercule armé de deux faisceaux d'épines divergentes. Le *H. bivittatus* peut servir de transition entre ces deux genres.

Etymologie.—δὶς, bis; πλῆκτρον, plectrum, que Cuvier traduit *éperon.*

GENUS MENTIPERCA.

Historique.—Ce genre a été établi par Mr. Gill, dans les Proceed. Acad. Philad., 1862, p. 236. Type : *Serranus luciopercanus*, Poey.

Caractères.—Le genre *Mentiperca* paraît bien établi, quoique l'auteur ne l'ait séparé des *Halipercæ* que par un menton proéminent et le petit nombre de cœcums (deux seulement).

L'avancement de la mâchoire inférieure, chez les *Halipercæ*, a été indiqué par moi; mais ce caractère n'est pas bien remarquable. Il est bien prononcé chez les *Mentipercæ*, ce qui leur fait un museau plus pointu; l'œil est plus grand. Le crâne, au lieu d'être arrondi, est plat en dessus. Le préorbitaire, très-développé, couvre tout le milieu de l'os maxillaire, et touche au bord de la lèvre. Ouvertures nasales extrêmement petites, surtout l'antérieure, qu'on peut à peine découvrir avec une forte loupe. Sauf ces différences, il a les caractères des *Halipercæ;* je ne suis pas certain cependant que l'on trouve derrière les premières dents de la mâchoire supérieure, la grosse dent qui de chaque côté se couche en arrière.

Etymologie.—Mentum—Perca.

GENUS HYPOPLECTRUS.

Historique.—Ce genre a été établi par Mr. Gill, Proc. Acad. Philad., 1862, pp. 236, 237 ; type, *Plectropoma puella* C. et V. Il y est placé dans la famille des *Percidæ*, sous-famille *Serraninæ.* "Dorsale entière, caudale échancrée, corps oblong, écailles petites, dents couchées en arrière des canines, préopercule ayant en dessous des dentelures dirigées en avant, le dit préopercule denticulé en dessous en forme de scie. D. 10, 14–15. J'ai accepté ce genre dans ma Synopsis, en 1868.

L'espèce citée par Mr. Gill est chez Cuvier et Valenciennes le type de leur 3^e division des *Plectropomæ*, laquelle, outre les dentelures fines du bord montant du préopercule, en montre au bord inférieur de nombreuses, presque aussi fines, mais dirigées en avant.

Etymologie.—ὑπό, sub ; πλῆκτρον, plectrum.

Caractères du genre.—Corps court, comprimé ; œil médiocre, haut ; narines rapprochées, plus près de l'œil que du bout du museau. Préopercule finement dentelé à son bord montant, sans échancrure, portant sur son bord inférieur 10 à 12 dentelures dirigées en avant. Opercule armé de trois pointes épineuses. Bouche bien fendue, la mâchoire inférieure dépassant la supérieure. Langue lisse. Voyez ce qui a été indiqué dans la sous-famille des *Serranini.*

Dents.—Il y a aux mâchoires un rang externe de petites dents coniques, crochues, précédées de deux courtes canines. En arrière, sur la mâchoire supérieure, il y a un rang de dents plus minces, plus nombreuses sur le devant, et qui paraissent couchées et mobiles. A la mâchoire inférieure les dents couchées ne se trouvent que sur le devant. Les dents du vomer sont sur une plaque triangulaire.

Nageoires.—D. 10, 15 ; A. 3, 7. La dernière épine dorsale est aussi longue que l'avant dernière ; l'étendue de la partie molle égale, à peu près, celle de la partie épineuse ; les épines anales sont fortes ; la caudale est échancrée. Il n'y a pas de lanières membraneuses à l'extrémité des épines dorsales.

Ecailles.—Les écailles sont fortement ciliées, aussi longues que hautes, adhérentes, plus fortes sur les joues que sur les deux pièces postérieures operculaires ; les plus grandes du tronc se trouvent sur les flancs, près de la pectorale ; celles de la gorge sont petites ; il y en a aux tempes, mais non pas sur le crâne, l'interopercule, le limbe préoperculaire, ni le bout du museau, inclus le maxillaire et le dentaire. Il n'y en a pas à la membrane des ouiës. De très-petites écailles s'étendent sur la base des nageoires verticales ; il n'y en a pas sur la base des pectorales.

Squelette.—Le crâne est arrondi à son sommet, l'espace interorbitaire médiocre, l'orbite plus rapproché de l'extrémité antérieure ; la crête suroccipitale basse et rejetée en arrière ; la mastoïdienne très-basse ; le nasal bas. Les cinq premières vertèbres abdominales manquent d'apophyses latérales ; les trois dernières paires forment l'anneau. Les premières névrapophyses sont plus fortes et plus courtes que les autres. L'appareil des côtes se compose de 2 épinévrales, 8 pleurapophyses, 6 épipleurales. Le 1er internévral soutient deux épines dorsales. Le coracoïdien est très-échancré vers le bas. L'os pelvien n'a pas d'apophyse ascendante.

Viscères.—L'intestin fait les circonvolutions ordinaires ; appendices pyloriques au nombre de 5 ; vessie natatoire à parois minces, quoique opaques ; vésicule du fiel allongé.

Histoire.—Ce genre paraît très-naturel. Les espèces qui le composent sont assez nombreuses, et de petite taille : environ 5 pouces.

GENUS GONIOPLECTRUS.

Historique.—Ce genre a été établi par Mr. Gill, Proceed. Acad. Philad., 1862, pp. 236, 237, parmi les *Percidæ*, sous-famille *Serraninæ*, dans la division de " Dorsale entière, caudale entière, corps oblong, écailles petites, dents couchées en arrière des canines; préopercule portant à son angle une dent plectroïdale dirigée en avant: D. 8. Type: *Plectropoma hispanum*, C. V. Je l'ai adopté dans ma Synopsis, en 1868.

L'espèce citée par Mr. Gill est le type du 2ᵉ groupe de *Plectropoma* de Cuvier et Valenciennes, distingué par le bord montant du préopercule dentelé, n' ayant au bord inférieur qu'un petit nombre de dentelures. Les espèces renfermées dans cette division ne forment pas un groupe naturel, comme le démontrent le *Pl. chloropterum*, le *Susuki*, le *Serratum*, le *nigrorubrum*, types aujourd'hui de nouveaux genres.

Etymologie.—γωνία, angulus; πλῆκτρον, plectrum.

Caractères du genre.—Corps court, œil médiocre, placé haut; préopercule finement dentelé à son bord montant, pourvu en dessous d'une forte épine partant de l'angle et se dirigeant en avant; opercule à trois pointes, celle du milieu extrêmement longue et forte.

Dents.—Les dents des mâchoires sont en cardes; il y en a sur le devant quelques-unes un peu plus longues, couchées et probablement mobiles; une seule canine en haut, forte; deux en bas longues et fortes, au milieu de la mâchoire. Les dents du vomer sur une plaque triangulaire; les palatines sur une bande étroite.

Nageoires.—D. 8, 13; A. 3, 7. Les rayons épineux de la dorsale sont assez courts et forts, le dernier plus court que celui qui le précède; la partie molle a peu d'étendue relativement à la portion épineuse. Les épines anales sont très-fortes. La pectorale est plutôt arrondie que pointue. Ventrale retenue par une membrane axillaire.

Ecailles.—Les écailles sont ciliées. La ligne latérale se relève et ne suit pas la direction parallèle au dos. Il y a des écailles sur toutes les pièces operculaires; celles des joues sont petites; il n'y en a pas sur le crâne, qui est âpre, ni sur le devant du museau; elles montent sur les nageoires médianes jusqu'aux deux tiers de leur hauteur; il y en a même quelques-unes sur la membrane épineuse de la dorsale. L'os surscapulaire envoit au dehors sa lame plate.

Squelette.—Malgré la grande différence que présente, au premier aspect, ce genre comparé avec les *Hypoplectri*, l'examen du crâne révèle entre eux une grande affinité. Ainsi il est arrondi en dessus, la crête suroccipitale est au-dessous du niveau frontal; les autres crêtes sont basses; la distance interorbitaire médiocre; mais le nasal n'est pas bas. J'ignore si le labial existe. Les apophyses latérales des vertèbres abdominales se montrent à commencer de la 7^e, les trois dernières paires formant l'anneau. La 1^e névrapophyse chevauche; les trois qui suivent sont fortes et rejetées en arrière, les quatre autres sont courtes; celles qui suivent sont normales. Je ne crois pas qu'il y ait entre les chairs de fausses épines internévrales.

Viscères.—L'intestin est étroit, et fait les circonvolutions ordinaires. J'ai compté 8 appendices pyloriques, courts et fermes. J'ai trouvé des crustacés dans son estomac.

Observations.—Si l'on n'avait égard qu'à l'épine sous-préoperculaire, on placerait ce genre à côté du genre *Prospinus;* mais le nombre des épines dorsales et la forme du crâne rapproche ce dernier des *Epinepheli;* tandis que le genre *Gonioplectrus* se rapproche davantage des *Hypoplectri.*

SUBFAMILIA II.—LUTJANINI.

Une seule dorsale, la partie épineuse presque entièrement logée dans un sillon du dos. Préopercule dentelé; opercule sans épines ou n'en portant qu'une plate. Mâchoire inférieure peu avancée. Un rang de dents extérieures, solides et plus fortes que les intérieures, qui plus ou moins les accompagnent; des canines sur le devant des mâchoires. Le premier sous-orbitaire, très-développé, recouvre en partie l'extrémité postérieure du maxillaire. Pectorale pointue; dernier rayon de la ventrale attaché à l'abdomen par une membrane axillaire. Il n'y pas de lambeau cutané écailleux au-dessus de l'axille pectorale. Mais il y a toujours un lobule écailleux au-dessus de la base de la ventrale. La caudale est échancrée ou bifurquée. Les écailles sont grandes ou médiocres. Le limbe préorperculaire est nu; l'os surscapulaire perce en dehors. Le post-frontal n'a pas d'os caverneux solidement encaissé dans l'apophyse post-orbitaire. Quand l'os existe, il y est lâchement encaissé. La fosse paroccipito-mastoïdienne est ouverte et se continue jusq'au frontal. Il n'y a pas d'os labial. Il y a dans les chairs, au-devant de la dorsale, trois fausses épines internévrales.

On voit que c'est à juste titre que Mr. Gill a formé cette sous-famille, qui se distingue assez nettement de l'antérieure; en même temps qu'elle se rapproche de la famille des *Sparoïdæ*. Voyez là-dessus ce qu'en dit Mr. Gill, Proced. Acad. Philad., 1862, p. 446, d'après les vues de Mr. Troschel. Le genre *Lutjanus* est le type normal de cette coupe: c'est le genre *Mésoprion* de Cuvier.

Voici les genres compris dans cette sous-famille:—

1. *Ocyurus.*—Species: *chrysurus*, Bl.—*aurovittatus*, Ag.—*ambiguus*, Poey.—*lutjanoïdes*, Poey.
2. *Rhomboplites.*—Species: *elegans*, Poey.
3. *Lutjanus.*—Species: *Caxis*, Bl.—*Jocu*, Cuv.—*Caballerote*, Bl.—*Cubera*, Poey.—*Buccanella*, Cuv.—*Aubrieti*, Dem.—*Ojanco*, Poey—*profundus*, Poey—*Campechianus*, Poey—*analis*, Cuv.—*rosaceus*, Poey.
4. *Tropidinius.*—Species: *Arnillo*, Poey.
5. *Platyinius.*—Species: *vorax*, Poey.
6. *Etelis.*—Species: *oculatus*, Val.
7. *Verilus.*—Species: *sordidus*, Poey.

GENUS OCYURUS.

Historique.—Genre établi par Mr. Gill, Proceed. Acad. Philad., 1862, pp. 236, 237, où il en donne les caractères suivants, servant à le distinguer des autres genres de Cuba : " Famille des *Percidæ*, sous-famille *Lutjaninæ*, caudale bifurquée à lobes très-aigus." Le type cité est le *Mesoprion chrysurus* de Cuvier et Valenciennes.

Etymologie.—ὠκὺς, celer ; οὐρὰ, cauda.

Caractères du genre. — Le genre *Ocyurus*, considéré dans son type, présente les caractères qui suivent : Corps élégamment oblong. Opercule sans épines. Narines écartées, à-peu-près à égale distance de l'œil que du bout du museau. Bouche petite, la mâchoire inférieure dépassant un peu la supérieure. Langue âpre.

Dents.—Les mâchoires portent une rangée de petites dents aigues, écartées, sans canines remarquables ; derrière cette rangée il y a en haut une bande d'aspérités, ainsi qu'en bas sur la partie antérieure seulement ; il y a des aspérités aux palatins et au vomer ; ce dernier en présente une plaque rhomboïdale ; les os pharyngiens ont des dents en fin velours. Le premier arc des branchies porte de longues râtelures.

Nageoires.—D. 10, 13 ; A. 3, 9. L'étendue de la partie molle de la dorsale est un peu moindre que celle de la partie épineuse. Caudale bifurquée, à lobes très-aigus, portée sur un pédoncule étroit.

Ecailles.—Elles sont assez grandes, environ 55 le long de la ligne latérale, qui est parallèle au dos ; il y en a aux tempes, aux joues, et sur l'appareil operculaire, sauf le limbe du préopercule ; le reste de la tête en est dépourvu.

Squelette.—Le crâne, vu en dessus, est large ; l'espace interorbitaire assez grand et enfoncé ; la crête suroccipitale très-haute, et se continuant avec la crête frontale jusqu'à l'articulation du nasal. Les apophyses latérales des vertèbres abdominales commencent à la 6^e vertèbre. Le 1^{er} internévral ne soutient qu'une seule épine. L'appareil des côtes se compose de 2 épinévrales, 8 pleurapophyses, 6 épipleurales.

Viscères.—Circonvolutions ordinaires ; cœcums au nombre de 5 ; vessie aérienne longue, opaque, argentée.

GENUS RHOMBOPLITES.

Historique.—Ce genre a été établi par Mr. Gill, dans les Proceed. Acad. Philad., 1862, pp. 236, 237 ; type : *Centropristis aurorubens*, Cuv. et Val. Il y est mis dans la famille des *Percidæ*, sous-famille *Lutjaninæ*, caudale échancrée, dents vomériennes sur une plaque rhomboïdale. Je l'ai adopté dans ma Synopsis, en 1868.

Etymologie.—ῥόμβος, rhombus ; ὅπλισις, armatura.

Caractères du genre.—Corps oblong, élégant ; œil grand, peu élevé ; narines rapprochées, aussi éloignées de l'œil que de l'extrémité du museau ; préopercule finement dentelé à sa branche montante, bien denté à l'angle et sur la branche inférieure ; opercule à une seule pointe épineuse, plate. Bouche petite, mâchoire inférieure dépassant la supérieure. Langue âpre.

Dents.—Les mâchoires présentent extérieurement une rangée de dents aigues, écartées, plus grandes d'avant en arrière, mais sans canines prononcées. La rangée d'en haut est accompagnée intérieurement d'une bande de dents en cardes fines ; tandis que celle d'en bas n'en a que sur la partie antérieure. Dents vomériennes sur une plaque rhomboïdale ; celles des palatins sur une large plaque. Pharynx à dents en velours. Premier arc des branchies à longues râtelures.

Nageoires.—D. 12, 11 ; A. 3, 8. La partie molle de la dorsale est d'une étendue beaucoup plus courte que celle de la partie épineuse. Caudale bien échancrée.

Ecailles. –Elles sont ciliées, de grandeur médiocre, environ 60 le long de la ligne latérale, qui est parallèle au dos. La tête en montre jusqu'aux tempes ; la joue en est couverte, aussi grandes qu'à l'opercule ; il y en a à l'interopercule, mais pas au limbe préoperculaire. Le reste de la tête en est dépourvu. Le surscapulaire laisse voir son bord postérieur en dehors.

Squelette.—Le crâne, vu en dessus, est aplati, le diamètre postérieur grand, ainsi que l'espace interorbitaire. La crête suroccipitale est haute, se continuant avec la frontale; les autres sont basses. Une large perforation basilaire conduit aux fosses sous-craniennes. L'orbite occupe un espace plus près de l'extrémité antérieure que de la postérieure. Sous-orbitaires au nombre de quatre. Prétympanal portant une apophyse laminaire. Les apophyses latérales de l'abdomen commencent à la 5ᵉ vertèbre. Il y a de chaque côté 2 épinévrales, 8 pleurapophyses, 6 épinévrales. La 1ᵉ épine internévrale supporte deux rayons épineux. L'os pelvien n'a pas d'apophyse ascendante.

Viscères.—Circonvolutions ordinaires. Cœcums, 5.

Observations.—On voit que ce qui distingue principalement ce genre de celui que Mr. Gill nomme *Lutjanus*, c'est le nombre 12 des épines dorsales ; car la plaque rhomboïdale du vomer est un caractère commun à plusieurs Lutjans. J'ai pris pour type, quant aux caractères du genre, le *Rh. elegans* de l'île de Cuba.

Histoire.—Mœurs carnivores ; taille médiocre.

GENUS LUTJANUS.

Historique.—Ce genre a été établi par Bloch en 1797, dans son Ichthyologie, Pars 7, p. 324, sous les caractères suivants: " tête nue antérieurement; préopercule dentelé, opercule sans épines ; museau aigu." Il a pour première espèce son *Lutianus Lutianus* du Japon, qui est le *Mesoprion Lutjanus* de Cuvier, dont les nombres sont : D. 10, 13 ; A. 3, 8.

Cuvier, en 1817, avait adopté ce genre ; mais il l'a abandonné en 1828, et l'a remplacé par celui de *Mésoprion*, parce qu'il est mêlé dans Bloch à des espèces d'autres familles, soit *Sciénoïdes*, soit *Labroïdes*, et à des Serrans du groupe des Mérous. Si cette raison pouvait être admise, il faudrait supprimer bien d'autres genres.

Mr. Gill, croyant sans doute que le poids d'un grand nom ne saurait nuire à la priorité, a rétabli le genre de Bloch dans les Proceed. Acad. Philad., 1862, pp. 236, 237, comme synonyme de *Mesoprion*, Cuv. Mr. Demarest l'avait déjà accepté; et avant lui, Lacépède, en ajoutant le caractère de "une seule nageoire dorsale." Mr. Gill lui assigne: "*Lutjaninæ*, caudal emarginated, profile straight; occiput crested." Son type est le *Mesoprion griseus*, Cuv., qui est le même que le *Lutjanus Caxis*.

Le Dr. Günther a conservé le nom de Cuvier. Je crois avec Mr. Gill que le genre *Diacope*, Cuv., soit *Genyroge* de Cantor, doit être confondu avec les *Lutjani*.

Etymologie.—Du mot *Lutjang*, que Bloch avait cru du Japon, et qui est malais, selon Cuvier. Bloch écrit en latin *Lutianus*.

Caractères du genre.—Voici comment je présente les caractères du genre *Lutjanus*, prenant pour type le *Mesoprion Caxis*, n'ayant pas en mon pouvoir le type cité par Bloch.

Corps oblong, un peu élevé; museau aigu; mâchoire inférieure un peu moins avancée que la supérieure; opercule finissant en angle mousse et non-épineux; préopercule presque pas dentelé en dessous. Langue tantôt lisse, tantôt âpre.

Dents.—La mâchoire supérieure a une rangée externe de dents aigues, écartées, les dernières plus petites; elle est précédée de deux canines très-longues; en dedans il y a une large bande d'aspérités. La mâchoire inférieure n'a pas de canines remarquables, mais seulement une rangée externe de dents aigues, plus longues que celles d'en haut, et les dernières plus petites; en dedans il n'y a qu'une plaque étroite d'aspérités sur le devant. Les dents du vomer sont tantôt sur un simple chevron triangulaire, tantôt sur une plaque rhomboïdale qui se prolonge en arrière en angle très-aigu. Les dents pharyngiennes inférieures sont en velours ; mais le bord interne en porte une rangée de plus grosses et crochues, ainsi que les os supérieurs. Le premier arc des branchies a de longues râtelures.

Nageoires.—D. 10, 14 ; A. 3, 8. La caudale est échancrée, mais non pas profondément.

Ecailles.—Elles sont ciliées, de 45 à 50 sur une ligne longitudinale. Il y en a aux pièces operculaires, aux tempes, aux joues ; mais non pas sur le crâne, sur le museau, ni sur le limbe du préopercule. Il y en a sur la base des nageoires verticales, partie molle ; mais non pas sur la base des nageoires paires. Elles sont d'égale grandeur sur la joue et sur l'opercule.

Squelette.—Le crâne est étroit en arrière. La crête suroccipitale plus ou moins élevée ; l'œil placé au milieu de la longueur cranienne ; l'espace interorbitaire étroit ; le trou qui livre passage au nerf trijumeau est presque marginal. L'appareil sous-orbitaire porte en tout cinq os, dont le dernier paraît articulé sur l'apophyse postorbitaire, mais très-lâchement. Il y a 2 épines épinévrales, 8 pleurapophyses, 7 épipleurales. Le 1^er^ internévral porte deux épines du dos.

Viscères.—L'intestin fait les circonvolutions ordinaires. La vessie aérienne est ordinairement solide ; quand ses parois sont minces, elles ne sont pas transparentes. La vésicule du fiel est longue et étroite. Les cœcums, au nombre de 5, mous et courts.

Observations.—Ce genre admet quelques subdivisions : ainsi les espéces nommées *Caxis*, *Jocu*, etc., ont de longues canines à la mâchoire supérieure, et de grosses dents à l'inférieure ; en même temps que les rayons mous des nageoires médianes sont plats, très-divisés et contigus. D'autres ont les dents moins remarquables, surtout le *Lutjanus Ojanco*, et les rayons mous peu divisés. Il y a encore des différences à l'égard de la convexité otocranienne.

GENUS TROPIDINIUS.

Historique.—Ce genre a été établi par Mr. Gill, qui n'en a pas encore fait connaître les caractères. Je l'ai adopté dans ma Synopsis en 1868, d'après les renseignements manuscrits de l'auteur, savoir : " Distinguished by the elevated occipital crest; strengthened by a subvertical rib behind, and the simple paroccipital process." Type : *T. Arnillo*, Poey.

Etymologie.—τρόπις, carina; ἰνίον, nucula.

Caractères du genre.—Corps oblong. Narines rapprochées, plus près de l'œil que de l'extrémité du museau ; une seule épine à l'opercule ; préopercule finement dentelé à la branche montante et à l'angle, sinueux en dessous ; bouche médiocrement fendue, mâchoire inférieure un peu avancée. Langue lisse.

Dents.—Les dents des mâchoires sont courtes et pointues, sur un rang externe ; précédées de deux canines en haut et trois en bas. Intérieurement, il y a en haut une bande en velours ras, ainsi qu'en bas ; mais ici il n'y en a que sur la partie antérieure. Celles du vomer sont sur un simple chevron transversal, et aux palatins sur une seule ligne. Les os pharyngiens ont des dents en velours en bas, en cardes fines en haut. Le premier arc porte de longues râtelures.

Nageoires.—D. 10, 10 ; A. 3, 8. La caudale est échancrée ; la ventrale n'a pas de lobe écailleux au dessus de sa base.

Ecailles.—Environ 60 sur la ligne latérale, qui suit la courbure du dos ; il y en a sur la joue, mais non pas sur le limbe du préopercule ; les autres pièces operculaires en sont pourvues ; on en voit un groupe aux tempes : le reste de la tête est nu. Les nageoires verticales antérieures n'en ont pas.

Squelette.—Le crâne est médiocrement élargi en arrière et sur l'espace interorbitaire ; la crête suroccipitale commence vers le milieu de l'orbite ; elle est haute, tronquée en arrière ; les deux autres sont basses. La convexité otocranienne ne se montre pas en dehors. L'opercule est arrondi et échancré vers le haut, son épine unique renforcée intérieurement. Cinq sous-orbitaires; prétympanal sans apophyse laminaire. Les apophyses latérales abdominales commencent à la 5e vertèbre, les trois dernières paires formant l'anneau. Les quatre premières névrapophyses sont assez fortes. Le 1er internévral supporte deux épines du dos. L'os pelvien n'a pas d'apophyse interne ascendante.

Viscères.—Cœcums, 5.

Observations.—Le nombre des rayons de la dorsale, et la base nue de cette nageoire, ainsi que de l'anale, distinguent principalement ce genre des *Lutjani.* L'écaille ventrale sur-axillaire manque. L'opercule et le prétympanal offrent encore des différences.

Genus Platyinius.

Ce genre a été établi par Mr. Gill, en 1862, dans les Proceed. Acad. Philad., pp. 236, 237, dans la sous-famille des *Lutjaninæ;* ayant "la caudale échancrée, les dents du vomer sur une plaque triangulaire, le profil bossu, l'occiput plat." Type: le *Mesoprion vorax*, Poey. Il rentre dans le genre *Anthias* de Bloch, ou *Serrans barbiers* de Cuvier et Valenciennes. Mr. Gill a cependant démontré dans son article sur le genre *Etelis*, Proceed. Acad. Philad., 1862, p. 447, que sa plus grande affinité est avec les Lutjans, ou Mesoprions de Cuvier. Je l'ai adopté dans ma Synopsis, en 1868.

Etymologie.—πλατὺς, latus; ἰνίον, nucula.

Caractères du genre.—Malgré la dorsale sans échancrure, qui distingue ce genre, il est tellement rapproché du genre *Etelis*, que je crois devoir le décrire par simple comparaison (voyez ci-dessous). Il a les caractères de ce dernier, savoir, la même colonne vertébrale, les mêmes pièces operculaires, l'œil grand, la bouche bien fendue, le dentaire avancé, la caudale bifurquée, les écailles manquant au-dessus et au-devant de la tête, ainsi qu'aux nageoires, sauf le long des rayons de la caudale. Il s'en distingue par la dorsale entière et par les détails qui suivent. Le corps est oblong, sans être élancé; tronçon de la queue plus court, lobes moins inégaux; le museau plus bombé; l'œil plus petit, le dentaire moins avancé; le maxillaire et le dentaire sans écailles; le préopercule plus dentelé à l'angle et en-dessous; la partie molle de la dorsale plus étendue; les épines anales plus fortes; le dernier rayon mou de cette nageoire non-divisé; les écailles plus petites, 60 sur une ligne longitudinale; celles de la caudale plus nombreuses.

Les dents des mâchoires offrent quelques différences: je les décris minutieusement ici. En haut, il y a d'abord deux ou trois canines, puis vient la rangée externe de dents pointues, au nombre à-peu-près de 12, et quelques-unes plus petites; dans l'intérieur il y en a une bande en velours ras, plus large sur le devant, où les plus intérieures sont les plus longues. En bas, il y a d'abord 5 à 6 dents en crochets, plus petites que les canines d'en haut, et elles vont en augmentant de la première à la dernière; immédiatement après vient la rangée de dents externes, plus petites et plus nombreuses que celles d'en haut. Dans l'intérieur, le devant seulement est pourvu d'une bande de dents en cardes fines, dont les plus intérieures sont les plus longues, mais non pas mobiles.

Le crâne est construit sur le même modèle que celui de l'*Etelis;* il en diffère cependant par un frontal plus prolongé, et les deux crêtes latérales plus basses, ce qui détache un peu plus la crête suroccipitale.

GENUS ETELIS.

Historique.—Ce genre a été établi en 1828, par Cuvier et Valenciennes, Poiss. II., p. 127, famille des Percoïdes; " ayant tous les caractères des Perches proprement dites, sauf une rangée externe de dents en crochets, et se distinguant du genre

Lucioperca par les palatins tout en velours et par ses opercules pourvus de deux pointes." Le type est le *E. carbunculus*, C. V.

C'est un démembrement du genre *Anthias* de Bloch, qui peu-à-peu se trouvera réduit à une seule espèce, le *Labrus Anthias*, L., *Anthias sacer*, Bl., dont Rafinesque a fait le genre *Aylopon :* cette espèce a des particularités remarquables aux dents des mâchoires et au pièces operculaires ; et surtout aux vertèbres, qui sont 10–16.

Swainson, en 1839, Nat. Hist. of Fishes, etc., II., pp. 168, 202, le présente sous le nom de *Eteles*, en ajoutant le caractère de " caudale à lobes inégaux." Il établit en même temps le genre *Elastoma*, qui en diffère, selon lui, par les lobes égaux et la nageoire dorsale profondément échancrée, sa partie épineuse plus étendue que la postérieure, l'œil très-grand ; type, *Serranus oculatus*, C. V. On voit que les illustres auteurs de l'Histoire générale et particulière des Poissons n'ont pas connu la grande affinité qui existe entre le *carbunculus* et le *oculatus ;* ni Swainson non plus. Le Dr. Günther a suivi l'exemple de Cuvier et Valenciennes. Mr. Gill a démontré que ces deux espèces appartiennent au même genre. Le nom de Swainson doit donc passer à la synonymie.

Il en est de même du genre *Hesperanthias* de Lowe, Fishes of Madeira, 1843, puisqu'il prend pour type le *S. oculatus*, ainsi que Swainson. C'est encore le genre *Macrops*, établi par Mr. Ch. Duméril en 1856, Ichth. analyt., p. 279.

Il faut consulter sur ce sujet et sur les caractères détaillés du genre un bon article de Mr. Gill, inséré dans les Proceed. Acad. Philad., 1862, p. 447, sous le titre de " On the Synonymy and Systematic Position of the Genus *Etelis* of Cuvier and Valenciennes."

Etymologie.—Nom propre d'un poisson dans Aristote.

Caractères du genre.—J'ai profité du travail de Mr. Gill . j'y ai ajouté quelques autres particularités, principalement celles qui ont été prises sur le squelette.

Corps oblong, élancé ; racine de la queue longue. Dorsale unique, presque double à cause de son échancrure profonde; l'espace entre les yeux plan, ainsi que l'occiput; museau court, bouche grande; œil très-grand; narines rapprochées, beaucoup plus près de l'œil que de l'extrémité du museau; le préopercule n'a pas d'échancrure; son bord montant est finement pectiné, l'angle et le dessous sont denticulés; l'opercule est armé d'une pointe assez forte, l'inférieure n'éxistant pas, la supérieure très-plate; maxillaire terminant sous le tiers postérieur de l'œil; mâchoire inférieure plus avancée que la supérieure; langue lisse.

Dents.—Les mâchoires ont une rangée extérieure de dents en crochets, petites, écartées, les premières d'en haut un peu plus fortes; parmi celles-ci on remarque une canine peu développée en haut, et une plus petite en bas. A l'intérieur, la mâchoire supérieure porte une bande de dents en velours ras; et l'inférieure aussi, mais sur le devant seulement. Il y a des dents en velours au vomer, sur un chevron angulaire; aux palatins, sur une bande étroite, ainsi qu'aux pharyngiens. De longues râtelures au premier arceau des branchies.

Nageoires.—D. 10, 11; A. 3, 8. La partie molle de la dorsale a peu d'étendue. L'anale a les épines faibles. Caudale bifurquée, lobes aigus, le supérieur plus prolongé que l'inférieur. Le dernier rayon mou de la dorsale n'est pas divisé; il se prolonge en filament, ainsi que le dernier de l'anale; mais celui-ci est divisé. Il n'y a pas de lobe écailleux au-dessus de la base des ventrales.

Ecailles.—Les écailles sont ciliées, au nombre de 50 sur une ligne longitudinale; la ligne latérale suit la courbure du dos. Il y a des écailles aux joues, aux tempes, au maxillaire, au dentaire; mais non pas sur le préorbitaire, qui est strié, ni sur la tête, ni sur le limbe du préopercule. Il n'y en a pas non plus aux nageoires, sauf à la base de la caudale.

Squelette.—Le crâne est-très large et plat entre les deux orbites, et le bord orbitaire bien strié en travers. L'œil occupe le milieu du crâne. La crête suroccipitale, sans être trop basse, ne s'avance pas sur le front: il y a un trait élevé en travers là où commencent les crêtes. Le basilaire est percé d'une grande fente, qui conduit aux fosses sous-craniennes, lesquelles sont très-amples. Il y a cinq os dans l'appareil sous-orbitaire. L'apophyse laminaire du prétympanal est très-petite. Les apophyses latérales abdominales ne commencent à se bien prononcer qu'à la 4ᵉ ou 5ᵉ vertèbre; les trois dernières paires forment l'anneau. Les premières névrapophyses sont basses et un peu robustes sur les premières vertèbres qui suivent. L'appareil des côtes compte de chaque côté 2 épinévrales, 8 pleurapophyses, 7 épipleurales. La 1ᵉ épine internévrale supporte deux rayons épineux du dos. L'os pelvien a une apophyse interne ascendante.

Observations.—Ce genre ne contient aujourd'hui que trois espèces, qui peut-être n'en font qu'une; la première est Atlantique, région intertropicale; la seconde est du Japon, la troisième, de l'île de Bourbon. Malgré l'échancrure de la dorsale, les affinités sont plutôt avec les *Lutjanini* qu'avec les *Percidæ*, comme Mr. Gill l'a démontré. Le genre *Platyinius* sert d'intermédiaire.

GENUS VERILUS.

Historique.—Ce genre a été établi par moi en 1860, dans mes *Memorias sobre la Historia natural de la isla de Cuba*, II., p. 125, tab. 12, f. 6, famille des Percoïdes, voisin du genre *Etelis*, mais s'en distinguant quant à la dentition. Type: *V. Sordidus*, Poey. Mr. Gill le cita dans les Proceed. Acad. Philad., d'abord dans la sous-famille des *Serraninæ*, 1862, p. 236, indiquant avec doute 5 rayons aux branchies, pour le distinguer du genre *Elastoma* (le *Verilus* a 7 rayons); mais après son article sur le genre *Etelis*, 1862, p. 445, il est certain qu'il le considère aujourd'hui comme appartenant à la sous-famille des *Lutjaninæ*.

Etymologie.—Du mot espagnol *veril*, qui signifie haut-fond coupé à pic.

Caractères du genre.—Je renvoie au genre *Etelis*, pour avoir par comparaison la description du genre actuel. Il lui ressemble probablement par l'aplatissement de la partie supérieure de la tête; il a, comme lui, le museau court, l'œil grand, la bouche grande, la mâchoire inférieure avancée, la langue lisse, les mêmes dents du vomer et des palatins, le même préopercule, l'opercule portant deux épines plates, le sillon dorsal, la nageoire dorsale aussi profondément échancrée et sous le même nombre 10, 11; les épines anales faibles, la caudale bifurquée, la pectorale pointue, le maxillaire écailleux, l'écaille surscapulaire.

Il en diffère par un corps oblong moins allongé, par l'anale 3, 7, P. 15; lobes de la caudale égaux et moins prolongés, dernier rayon des nageoires verticales divisé et non-filamenteux; 45 écailles sur une ligne longitudinale; j'ignore s'il en a au sous-orbitaire et au limbe du préopercule; mais il y en a à la base de la dorsale molle et de l'anale; celles du tronc sont minces et caduques, pourvues d'éventail et centre granuleux, non-ciliées sur leur bord libre. La principale différence est dans les dents des mâchoires. Dans celles d'en haut, c'est une bande d'aspérités portant seulement en dehors et sur le devant une dent canine (ou deux s'il y en a une de rechange); dans celle d'en bas, c'est un rang externe de dents petites et serrées, et une bande intérieure en velours sur le devant; il y a de plus une petite canine dont la pointe se rejète en arrière.

Je n'ai pas étudié le squelette.

Les viscères présentent les circonvolutions ordinaires de l'intestin, qui est étroit et ferme; les cœcums sont au nombre de 6 à 7.

Ce genre renferme à Cuba une seule espèce. Une forme analogue le représente peut-être au Japon, dit Mr. Gill, dans le genre *Caprodon* de Temminck et Schlegel.

SUBFAMILIA III.—PERCINÆ.

Deux dorsales, la première portant des rayons épineux. Dents des mâchoires en velours, sans canines distinctes.

Genres de cette sous-famille :—
1. *Chorististium.*—Species : *rubrum*, Poey.
2. *Liopropoma.*—Species : *aberrans*, Poey.

GENUS CHORISTISTIUM.

Ce genre a été établi par Mr. Gill, dans les Proceed. Acad. Philad., 1862, p. 15; ayant pour type mon *Liopropoma? rubrum*, dans la famille des *Percidæ*, sous-famille *Percinæ*. Voici les caractères qu'il en donne: "Body fusiform, with the caudal peduncle high and compressed. Head rather elongated, conic in profile and acute in front, but with the outline slightly curved; lower jaw protuberant, teeth villiform on the jaws, vomer, and palatine bones. Preoperculum entire. Operculum armed with two spines. Scales on the whole body except the muzzle. Dorsal fins entirely separated; the first with five spines diminishing from the second; the second dorsal with a simple spine. Anal armed with three graduated spines, and with the soft portion elevated backwards. Caudal subtruncated. Lateral lines anteriorly arched."

Etymologie.—χωριστὸς, separatus ; ἱστον, velum.

La pectorale est pointue ; les écailles montent sur la 2ᵉ dorsale et sur l'anale. D. 5, 1, 12 ; A. 3, 8 ; P. 13. Il y a trois épines operculaires, mais il n'y a que celle du milieu qui soit forte ; les deux autres sont plates. Les dents des mâchoires sont en fin velours ; mais il y en a d'autres dans l'intérieur sur le devant, longues et grêles, ayant l'aspect d'être mobiles ; celles du vomer sont placées sur un espace triangulaire. La crête suroccipitale est basse.

GENUS LIOPROPOMA.

Ce genre a été établi par Mr. Gill, dans les Proceed. Acad. Philad., 1861, p. 32, dans la famille des *Percidæ*, sous-famille *Percinæ*, dans la division de " Dents en velours à l'intermaxillaire, au vomer et aux palatins, ayant des pseudobranchies, toute la tête couverte d'écailles, préopercule ordinairement entier, dorsale antérieure ayant environ 6 rayons. Le type est le *Perca aberrans*, Poey." Voici sa diagnose de p. 52 : "Body slender and fusiform. Head elongated, conic in profile and anteriorly acute. Preoperculum entire. Operculum armed with a strong spine. Scales covering the whole head and the bases of the vertical fins. Dorsal fins connected at their bases; the anterior with six spines, the middle of which are longest; the second armed with three spines, regularly increased in length. Anal fin with three spines; the fin increasing in height posteriorly. Caudal fin emarginate. Lateral line anteriorly strongly curved."

J'ajoute qu'il y a des écailles sur le maxillaire ; on en compte 45 sur une ligne longitudinale ; le surscapulaire ne perce pas en dehors. La ventrale est un peu avancée. D. 6+3, 12 ; A. 3, 8 ; P. 15 ; V. 1, 5 ; C. 17. Les dents des mâchoires forment une bande en velours, sans canines ni rang externe de dents plus fortes. Les dents en velours deviennent plus longues en avant, couchées en arrière, probablement mobiles. Le crâne est lisse et un peu arrondi en dessus ; l'espace interorbitaire médiocre ; la crête suroccipitale rejetée en arrière et très-basse, ainsi que la paroccipitale. La fosse exoccipito-mastoïdienne est bien marquée. La base esphenoïdale du crâne est droite. Vertèbres 10+14 ; les six premières sans apophyses latérales. Les trois premières névrapophyses sont fortes et courbées en avant.

Etymologie.—λεῖος, lævis ; πρὸ, ante ; πῶμα, operculum.

APPENDICE.

GENUS GRAMMA.

J'ai établi ce genre en 1868, dans ma Synopsis, p. 296, famille *Percidæ*, sous-famille *Lutjanini;* ligne latérale remontant très-haut et interrompue; caudale arrondie, un peu pointue. Par le seul fait de le placer près des Lutjans, on doit supposer qu'il en a les principaux caractères. En effet, les ventrales sont thoraciques, à 5 rayons mous; préopercule dentelé, opercule sans épines, pectorale pointue, écailles ciliées, peu nombreuses, 45 sur une ligne longitudinale; il n'y en a pas sur le crâne, sur le museau, ni sur les nageoires; il y a des dents au vomer et aux palatins.

Il en diffère par les épines dorsales, puisque la formule radiaire est D. 12, 9, A. 3, 9, C. 17, P. 17, V. 1, 5, et par la forme de la caudale. La mâchoire inférieure paraît dépasser un peu la supérieure. La partie molle de la dorsale a très-peu d'étendue; le premier rayon des ventrales forme un filament allongé. Les dents de la mâchoire supérieure sont très-fines; celles de la mâchoire inférieure sont bien visibles, pointues, crochues. Je n'ai pas indiqué de canines, et j'ai oublié de noter s'il y a d'autres dents sur une rangée intérieure. Je n'ai pris de notes non plus sur le nombre de rayons branchiostèges, la surface de de la langue, le frein membraneux des ventrales, l'écaille surscapulaire, ni tout ce qui se rapporte au squelette interne et aux viscères.

La plupart des caractères indiqués rapprochent ce genre des Pomacentres; mais il s'en éloigne par un trait de la plus grande importance, savoir, deux os pharyngiens inférieurs; ce que j'ai examiné avec soin dans l'exemplaire unique envoyé à Mr. Agassiz, sur lequel j'ai établi le genre; on n'y trouvera pas ces os, parce que je les ai enlevés pour en faire l'étude. Tous les Pomacentres que je connais ont le corps court, la bouche trés-petite, des écailles sur le crâne, et le palais manque de dents; leurs nageoires sont écailleuses.

GRAMMA LORETO. POEY.

Observations.—L'individu type n'avait que 50 millimètres de long. Cette taille, jointe à la grandeur de l'œil et aux narines très-rapprochées de l'orbite, paraissent annoncer le jeune âge de l'individu. Je l'ai figuré grossi, sous le nom de *Gramma Loreto.*

Etymologie.—γραμμὴ, linea; par allusion à la ligne latérale.

La partie antérieure du corps est bleuâtre, plus éclairci sur les flancs, et passant insensiblement au rouge sur la partie postérieure du tronc; les nageoires sont jaunâtres, la ventrale a le bord antérieur bleu. La membrane qui soutient les quatre premiers rayons épineux de la dorsale porte vers le bord une tache d'un bleu foncé. Il y a deux lignes noirâtres sur la partie postérieure de l'orbite, montant obliquement vers la nuque, la supérieure plus longue.

Deux espèces nouvelles de Poissons de Cuba, nommées dans l'article qui précède.

Lutjanus Cubera, Poey.

Poey, Proceed. Acad. Philad., 1863, p. 185; *Mesoprion cynodon* (Cuv.), nec typus. Vide quoque Repert. I., p. 268, 411; II., p. 157; et *Lutjanus cynodon* in Synopsis, p. 294.

Je vais décrire ce poisson par comparaison avec le *Lutjanus Caballerote.* Je n'ai pas besoin d'entrer dans le détail des formes, parceque ces deux espèces sont assez connues, quoique difficiles à distinguer, au premier aspect, l'une de l'autre. Le corps est toujours plus allongé que celui du *L. Caxis* et que celui du *L. Jocu;* et leurs couleurs n'ont pas les teintes jaunes du premier ni le rosé du second. Le *Cubera* est ordinairement brun, tirant sur le violet; le bord des écailles jète un reflêt mi-doré, chez les jeunes individus. Le ventre est rose; les nageoires vineuses. L'œil est brun-rougeâtre. Le *Caballerote* est teint à peu-près des mêmes couleurs: on y trouve quelquefois dans les jeunes, sous l'orbite, des points bleus longitudinaux, tels qu'on en voit chez le *Jocu* et parfois chez le *Caxis ;* mais on n'y trouve pas les bandes verticales qui sont si fréquentes chez ces derniers. Cependant, lorsque l'animal sort de l'eau, il présente des bandelettes verticales, blanches, qui ne tardent pas à disparâitre après la mort; ce qui probablement arrivera aussi au *Cubera.* Chez les deux espèces, on trouve les caractères indiqués dans le type, décrit par moi, du genre *Lutjanus ;* sauf les rayons de l'anale moins divisés, et ce qui sera dit plus bas. Le *Caballerote* arrive à dix livres de poids, tout au plus douze; le *Cubera* a très-souvent quarante livres, quelque fois cent.

Il faut être un pêcheur très-expérimenté, comme l'est à la Hav ane M. Pablo Lesmes, pour bien distinguer le *Cubera* du *Caballerote ;* d'autant plus qu'on prend rarement des *Cubera* jeunes, pour en faire la comparaison. A Matanzas, tout est dit *Cubera ;* et les *Caballerote*, en raison de leur taille, sont dits *Cubereta* (petites Cubera). A la Havane, au contraire, tout est *Caballerote*, parcequ'il est defendu de vendre le *Cubera.* J'ai donné dans les Proceedings de Philadelphie les caractères qui distinguent les deux espèces, en comparant deux individus du même âge, longs de 350 millimètres. La différence consiste, outre la taille, en ce que le *Caballerote* a le museau aigu, ce qui est dû d'abord à un prolongement plus grand, ensuite à un affaissement du profil; la bouche, plus petite, termine rarement au-dessous du bord antérieur de l'orbite. Le *Cubera* a le museau plus court, et obtus; la bouche, plus fendue, se rejète en arrière, et arrive souvent sous l'aplonb du milieu de l'œil. Mais ce dernier caractère, bien marqué dans le jeune âge devient équivoque chez le *Cubera* adulte; parceque l'œil diminuant avec l'âge, la bouche avance en proportion. Cependant la ligne du profil est suffisante pour le reconnaître à tout âge. La langue est lisse; celle du *Caballerote* est âpre. En étudiant nouvellement ces espèces sur les individus cités dans les Proceedings, j'ai trouvé un caractère tellement important, qu'il suffit à lui-seul pour enlever toute espèce de doute: c'est que les dents du vomer, chez le *Cubera*, sont sur un mince chevron transversal, tandis que, chez le *Caballerote*, elles forment une large plaque qui se prolonge en arrière, comme chez le *L. Caxis*, et prend un forme rhomboïdale.

J'avait d'abord cru que le poisson de Parra n'était pas le *Caballerote*, mais plutôt notre *Cubera*, à cause du racourcissement du museau que l'on remarque sur sa figure; mais c'est un défaut dans lequel l'auteur tombe quelquefois, comme on peut le voir dans son *Caxis*. Parra ne dit pas que le poisson devient très-grand; il dit seulement que son individu, dont il ne donne pas la mesure, est un des plus grands de son espèce. Or j'ai su par Mr. Goaells que l'exemplaire original, déposé au Muséum de Madrid, a 380 millimètres de long jusqu'à la bifurcation caudale. Mr. Perez Arcas a eu plus tard la bonté de m'écrire que la distance du bout du museau au bord postérieur du maxillaire est de 59 millimètres; et à l'œil, 64. C'est donc la vraie physionomie du *Caballerote*. D'ailleurs, Parra a bien connu le *Cubera*, ayant été lui-même empoisonné par un individu de cette espèce, comme il le rapporte, page 200 de son ouvrage.

La figure de Parra a suffi à Bloch pour établir l'espèce. Cuvier l'accepte dans sa synonymie; mais, sans respect pour la priorité, il nomme le poisson *Mesoprion cynodon:* il décrit des individus de la Martinique; et les caractères qu'il en donne sont communs aux deux espèces dont il est question dans cet article. Il ne donne ni la taille de l'animal, ni la forme du museau, ni la grandeur de la bouche relativement à l'œil; ce qui fait qu'on ne peut savoir quelle espèce est par lui décrite. D'autre part, il rapporte à son *cynodon* la *Sarde mulatresse* de St. Domingue, qui me semble devoir être plutôt rapportée au *L. Caxis*, dont il a les teintes jaunes et orangèes; ainsi que le *Yellow-tail Snapper*, cité sous le nom de Cuvier par Müller et Troschel in Schomburgk, Hist. of Barbadoes, p. 465.

En tout ceci, ce qu'il y a de certain, d'après Cuvier lui-même, c'est que le *Mesprion cynodon* est le même que le *Caballerote* de Parra, soit l'*Anthias Caballerote* de Bloch, qui a la priorité sur Cuvier. J'ai dû par conséquent donner un autre nom au véritable *Cubera* de Cuba.—N°. 153 de mon Atlas MSS.

Voici la synonymie du *Caballerote*, N°. 111 de mon Atlas.

Parra, p. 52, tab. 25, f. 1. Caballerote. 1787.

Anthias Caballerote B. Syst. p. 310. 1801.

Mesoprion cynodon Cuv. in C. V. Poiss., II., p. 465. 1828.

Sagra, Atlas MSS., tab. 36. *Caballerote.*

Günther, Catal. I., p. 194. *M. cynodon.* 1859.

Poey, Proceed. Philad., 1860, p. 187. *M. Caballerote;* Synopsis, p. 293, *Lutjanus Caballerote,* 1868. Vide quoque Repert. I., p. 268, 411; II., p. 157.

Hypoplectrus maculiferus, Poey.

La taille et la forme de ce poisson sont les mêmes que celles du Plectropome *puella* de Cuvier, inclus aujourd'hui dans le genre *Hypoplectrus* de Gill. Il a, comme lui, des bandelettes sur la tête; mais il se rapproche de mon *H. guttavarius* par la tache préorbitaire, quoique non-bordée de bleu. L'espèce la plus voisine est mon *H. aberrans*, dont il diffère par les lignes de la tête et par la couleur du tronc. [Voyez planche.]

La tête et le ventre sont orangés, mais le dessus de la tête est olivâtre; le tronc est terre d'ombre. Il y a une tache noire sur la caudale, et une tache préorbiraire d'un bleu très-foncé, sans bordure. Les bandelettes de la tête et de la gorge sont d'un bleu métallique. La dorsale est jaunâtre avec des traits bleus sur la partie molle. La pectorale est la caudale sont d'un orangé vif, mais la pectorale a le bord supérieur bleu; la ventrale est verdâtre, sa base est orangée; l'anale est orangée, son bord bleu.

Les écailles les plus grandes sont situées sur les flancs, près de la pectorale; les plus petites sont sur la région jugulaire. Il y en a de très-petites sur la base des nageoires verticales. Il n'y en a pas sur l'interopercule ni sur le museau.—N° 390.

Voyez les autres caractères dans la famille et le genre.

L'original sera envoyé au Professeur Agassiz, pour être déposé au Muséum de Cambridge.

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CONTENTS.

I.—Descriptions of New Species of Birds from Mexico, Central America, and South America, with a Note on Rallus longirostris. By GEO. N. LAWRENCE. 1

II.—Notes on the genus Pineria, and on the lingual dentition of Pineria Viequensis, Pfeiffer. By THOMAS BLAND and W. G. BINNEY. 22

III.—Genres des Poissons de la Faune de Cuba, appartenant à la Famille Percidæ, avec une Note d'introduction par J. Carson Brevoort. By FELIPE POEY. 27

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IV.—*On the Lingual Dentition of Helix turbiniformis, Pfr., and other species of Terrestrial Mollusca.*

BY THOMAS BLAND AND W. G. BINNEY.

Read May 15th, 1871.

Helix turbiniformis, Pfeiffer.

(Plate II., Fig. 2.)

JAW so extremely thin and delicate as to fold over upon itself along its edges and at its extremities; very light horn color, almost transparent; strongly arched, rather narrow, attenuated towards the ends, which are obtuse; divided into about forty separate perpendicular compartments composed of curving fold-like plates, whose extremities give a correctly serrated appearance to either margin; these plates or folds are straight at the centre of the jaw, and in no wise chevron-shaped upon the central line; upon about the centre of the jaw is a curving, horse-shoe shaped line of reinforcement, running somewhat parallel to the margin, below this line there are very delicate transverse striæ; the upper margin is slightly incurved at its centre, the lower margin has no approach to a median projection.

It is difficult to determine the precise nature of the fold-like plates into which this jaw is divided. They give the same appearance as if the whole substance of the jaw were plaited along its entire length, no interstices being left between the plaits. As the word plait would imply an actual folding of the substance of the jaw upon itself, we have not used that term, as there is in reality a simple thickening. In using the word plate, we do not intend to describe the jaw as composite, as in the case of *Orthalicus*, or *Achatina fasciata* and *virginea*, in which it seems to be composed of separate, *i. e.*, partially detached plates, imbricated one upon the other, with oblique sutures, those of the upper centre chevroned upon the central line, so as to leave an angular upper central plate. From this angular plate is derived the term *Goniognatha* used by Mörch for one of the sections into which he suggests the Geophila may be classified according to character of jaw. In the jaw of *H. turbiniformis* the central plates are perpendicular, with no approach to the angular arrangement. The plates must be considered, therefore, as a modification of the rib-like process, which characterizes most of the species of the genus *Helix*, as restricted by Albers and v. Martens, but by no means all of them, as we find a ribless jaw in *H. alternata*, *Hemphilli*, *striatella*, *asteriscus*, *labyrinthica*, *Phœnix*, *muscarum*, and *varians*, in the last of which we have also a highly developed median projection.

With the exception of the absence of angular plates at the upper centre, this jaw resembles very closely that of *Cylindrella rosea* (see photograph, Amer. Journ. Conch. V., plate XI.), or that of *Pineria Schrammi* (Ann. Lyc. N. Y., X. 22).

We now notice, for the first time, this form of jaw in the Genus *Helix*, in which stout, distinct ribs are usually found upon the anterior surface of the jaw, decidedly crenellating either margin. It is very common, however, in the genus *Bulimulus*, having been observed by us in *B. aurisleporis*, Brug., *sufflatus*, Gld., *membranaceus*, Ph., *papyraceus*, Mawe, *Jonasi*, Pfr., *alternatus*, Say, *pallidior*, Sow., and *aureolus*, Guppy, var. *Rawsoni*. In the jaw of *B. aurisleporis* there appear to be angular central plates.

In the Genus *Bulimulus*, however, the form of jaw under consideration is not constant, as that of *B. dealbatus*, Say, has distinct anterior ribs.

Helix turbiniformis is placed, by Albers and v. Martens, in the subgenus *Microphysa.*

The lingual membrane is long and quite narrow, composed of numerous oblique rows of about 25–1–25 teeth. Centrals large in proportion to the laterals, subquadrate, with broadly reflected triscuspid apex, the cusps very globose, the two outer ones unusually small and distant from the middle cusp; laterals like centrals, but bicuspid; marginal teeth wide, low, with small, stout, irregular denticles.

The jaw and lingual membrane above described were received, already mounted, through Governor Rawson, from Mr. Henry Vendryes of Jamaica, by whom they were taken from a Jamaica specimen, and who noticed and has corresponded with us on the peculiarity of the jaw.

Bulimulus laticinctus, Guppy.

(Plate II., Figs. 1, 5.)

A mounted lingual membrane of this Dominica species was received from W. R. J. Lechmere Guppy, of Trinidad.

Lingual membrane long, and quite broad in comparison to its length, composed of numerous waving rows of teeth. Centrals subpyramidal, the base excavated, the apex not pointed, but bluntly rounded and recurved into a stout obtuse long cusp, which is unequally divided into two blunt, stout lobes. Laterals very much longer and larger than the centrals, long, narrow, obliquely recurved into a greatly developed, unequally trilobed cusp. Marginals but little modified from the laterals in shape, but narrow, denticulated on the outer side of their reflected cusp, which last is bicuspid rather than trilobed.

Fig. 1 represents the central and lateral teeth; Fig. 5 one of the marginals.

Bulimulus Bahamensis, Pfr.

(Plate II., Figs. 3, 4.)

A specimen from New Providence, received from Governor Rawson, furnished the lingual membrane and jaws here described.

Jaw long, low, slightly arcuate, composed of over fifty separate plates, in some places divided by distinct, though narrow ribs. In two of the three jaws examined, the central plates are chevroned on the median line, leaving a distinctly triangular plate at the upper centre, whose base is up, its apex pointing downward. In the third specimen the plates are obliquely arranged, from above and outward to within and below, as on the whole surface of the jaw, but they reach quite across it, leaving no central triangular plate. The jaw is interesting, as it combines the characteristics of separate plates and distinct ribs.

Lingual membrane (Pl. II., Figs. 3 and 4) as already described in *B. laticinctus*. The points of the cusps, however, are more acute than in that species.

EXPLANATION OF PLATE II.

Fig. 1. *Bulimulus laticinctus*, to show the cusps of the central and lateral teeth.

" 2. *Helix turbiniformis*. Jaw.

" 3. *Bulimulus Bahamensis*. To show the cusps of the marginal teeth.

" 4. Same as Fig. 3. The cusps of central and lateral teeth.

" 5. Same as Fig. 1. One marginal tooth.

V.—*Notes on the Ascidea Manhattensis, De Kay, and on the Mammaria Manhattensis.*

BY THEO. A. TELLKAMPF, M.D.

Read May 23d, 1871.

DE KAY's description of the *Ascidea Manhattensis** is such that this species, the only simple Ascidian thus far known to occur on the shore of Manhattan Island, could not be classified as yet. He states, l. c., "the orifices are surrounded by ten to thirteen verrucose processes," while the branchial orifice is six-lobed, the anal orifice four-lobed; he calls the tubes distant, which generally are approximate, and omits to state that the muscular sac (mantle) is gelatinous, and that the branchial sac is not plicated. "In the young," he says, "besides, the orifices are both terminal," though they are commonly more or less distant, even approximate, and more rarely terminal.

Description: Corpore subgloboso, cinereo, sacculo gelatinoso, subverrucoso, subpellucido; tubis inæqualibus modice distantibus; osculo sexlobato, orificio anali quatuorlobato.

The orifices on very contractile tubes, the branchial is shorter and wider than the anal tube.

This species is to be referred accordingly to the *Molgulæ*, and I propose to name it *Molgula Manhattensis.* (Figs. 1, 2, 3.)

I have found it on the west, south, and east shores of Manhattan Island, particularly in places protected against the current of the water, attached to beams, boards, or rocks in Sandy Hook Bay, and in the Nevesink River to sea-grass, to about five feet below the surface of the water.

In a floating bathing-house anchored near the Battery I found the young, from one to three lines in diameter, earlier or later in June. Their earlier or later appearance, as well as development, depends on the higher or lower temperature of the season. During the unusually warm summer of 1856 a great many specimens were full grown—nine lines to one inch in diameter—as early as July 15, while commonly on the same date the largest specimens measure but six lines. The animal perishes, it appears, soon after the ova are ejected.

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* Nat. Hist. of the State of New York, Part V., p. 259.

Larvæ arrive through the summer months, and later, for young specimens were found constantly together with those more or less developed or full grown. Those which arrive late in the season (August and September) probably perish prematurely.

My observations on the general and minute anatomy of this species, and of some morphological changes of certain organs, particularly of the branchial sac, saccus calcareus, and ovaries, and on gemmation, I shall publish hereafter.

In connection with the foregoing statements, I offer some remarks on *Mammariæ*, which Lamarck* refers to the Ascidians as a sub-family, enumerating three species, and which he describes in the following manner: "Corpus librum, nudum, ovale aut subglobosum; apertura unica ad apicem." He says, l. c., that the organization of the *Mammariæ* was known so little that they could be classified only provisionally; he supposes that, in case the body had a double envelope, "les deux ouvertures, que l'on supposerait à l'intérieure, viennent aboutir à l'oscule unique, qui termine supérieurement à l'extérieure," and adds that doubtless further observations are necessary in order to enlighten us in this respect.

The literature on the Ascidians here at my disposal furnishes nothing new on the subject.

On the 16th of August, 1850, I found *Mammariæ* of about the same size of the so-called three species enumerated by Lamarck, the largest 1.5 lines l., 1 line br., with one terminal opening situated on a short tube slightly lobed at its edge, with circular and radial fibres (muscles) (57 diam.).* The muscular sac (mantle) of this *Mammaria* is tough, and contains much pigment. The majority of pigment cells are filled either entirely or partially with yellow and brown or black molecules. The latter are found at this stage of development in diverging lines from the base to the back, and on the back forming a line, in the middle broadest, tapering to its ends, surrounded by a light-colored space.

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* Hist. Nat. des Animaux sans Vertèbres, tom. iii. p. 473, 1841.

The orifice opens and closes at irregular intervals. The contraction of one is followed by the contraction of all others imbedded within the same common envelope.

While carefully removing the muscular sac, I ascertained that the short tube leads into the branchial sac, and that its internal membrane adheres to the muscular sac around the orifice. On further examination I found that the body is surrounded by a fibrous membrane, and that the greatest portion of the body consists of the branchial sac (about ¾), while the heart (and a mass of different cells, among them an aggregation of dark fat-cells, lying forward and near the branchial sac, and a body composed also of cells), inclosed within a membrane of its own, occupied the remaining space (¼).

At this stage of development there exists no intestinal tract, and consequently no internal opening.

The branchial meshes are more or less rectangular or oval in shape, provided with ciliæ on the inside, within the canal, along which red pigment is deposited, giving them a reddish appearance, the circulation of the blood peculiar to the Ascidians—for some time in one and after a short pause in the opposite direction—was visible. Near the base of the tube lies the circular canal of the branchial sac, into which all canals, cutting the other circular canals nearly at right angles, open, covered by the nervous ring, composed of light-yellow cells, corresponding nearly in size and color with the cells of the nervous ganglion of the *Molgula Manhattensis.*

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* All examinations were made on living animals; Plössl's large microscope was used.

The body, enclosed within its own membrane already mentioned, lying nearest the apex opposite the orifice, now claimed my special attention. When I examined it under the microscope, after rupturing its membrane by means of the compressorium of Purkinje, I discovered a body resembling an embryo (Fig. 4). After a few days it had changed its form; it was globular, with its tail partially surrounding the body, which, as soon as I had loosened it from the body with insect needles, made occasional sudden motions. No sexual organs existed at that time in the *Mammaria* in question. It was certain now that the *Mammaria* was a nurse.

I then examined many specimens, and found in each, as was to be expected, one larva within its chorion. In regard to the development of these larvæ, I shall make at present but a few statements, as it has been studied and accurately described by Milne Edwards, Kölliker, A. Krohn, and others. The younger larvæ had three, those more developed two appendages, those full grown three (?). These were conical at first, then became triangular in form, perforated from the middle of the base to its apex by a fine tubular canal; those fully developed had three appendages perforated by a small tubular canal, divided in its middle trichotomically (Fig. 5, *a*, *b*, *c*). It is a fact worthy of note, that the larvæ escape from their nurses about the same time, consequently in great numbers; for I found them to a certain day, but could not find any on the next following day, though I examined a great number of *Mammariæ.* It is in favor of the supposition that the larvæ of at least some simple Ascidians, as well as those of the Salpæ and of the compound Ascidians, form as such colonies floating in the sea during a time of their existence. An observation of Th. H. Huxley,* respecting a marsupial *Cynthia*, that "the originally free-tailed larvæ become firmly united before the withering away of their appendages," as well as other facts, support that supposition.

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* Report of the Brit. Ass. for the Adv. of Sc., 1852, p. 76.

The development of the *Mammaria* continues after the larva has escaped. Their aggregation in the common envelope in circular or oval form resembles that of the compound Ascidians. The common envelope increases in size, already observed by Milne Edwards in reference to the compound Ascidians; it contains, as I ascertained, elastic fibres (muscles), which contract independently of the contractions of the *Mammariæ.* Later in the season it assumes different forms; is gradually detached from the objects to which it adhered, and is then (September and October) carried away by the waves. The *Mammariæ* to which Lamarck refers were found floating in the water.

Within the common envelope gemmation takes place.

Having proved that the *Mammaria* observed by me is a nurse, I believe I can safely conclude that all *Mammariæ* are nurses, and it follows that they cannot be classified with the Ascidians as a subfamily.

In regard to the question to which parent animal the *Mammaria* under consideration stands in a genetic relation, I made some investigations during the following summer, 1851.

As I had found them on the mantles of the *Molgula Manhattensis*, after the ova were ejected, I inferred that its ova possibly might be metamorphosed into *Mammariæ*, being convinced already from previous studies respecting the structure of the cloaca, which represents a short tubular canal into which the vas deferens opens between the orifices of the (2) oviducts, as well as the development of the ovaries, etc., that the ova would be fecundated during their passage through the cloaca, and developed outside of the parent animal. Accordingly, when I observed that the ovaries of numerous animals were filled with mature eggs,—the germinative follicles (Keimschläuche) having disappeared, with the exception of comparatively few situated on the dorsal and ventral sides of the ovaries, their calices filled with mature ova, with the vesicles of Purkinje and the vesicle of Wagner (the latter appears first in the calyx, the former already in the germinative follicle, and such representing different stages of their development),—I watched from day to day for the ejection of the ova, and was fortunate enough to observe, on the 18th of July, 1851 (at high water), a viscid, yellowish substance deposited on the mantles of innumerable specimens attached to the sideboards of the bathing-house already mentioned, and on such only, which had been exposed to the rays of the sun during the afternoon, the tubes of which were directed more or less upwards,* which contained, as I anticipated, the fecundated ova. On examination of the ovaries of those specimens on which it was deposited, they were found flattened and almost empty, and when I examined under the microscope (300 diam.) the substance itself, I found that it contained mature and immature eggs and spermatozoids, both identical with those contained at the time in the ovaries and testes of full-grown specimens. Among the ova I noticed such, in which the process of segmentation had commenced already.

According to A. Krohn's† investigations of the development of the Ascidians, who observed the development of the ova of the *Phallusia mammillata* (Cuv.), artificially fecundated, that process begins within two or three hours after the spermatozoids have come in contact with the ova. The ova which I observed about 5 o'clock P.M. were ejected therefore probably at about 2 or 3 o'clock P.M.—under altered circumstances perhaps earlier—on the same day. This observation proves conclusively what Cuvier and von Baer, and more recently Krohn, expressed as an opinion that, with some simple Ascidians, (*Phallusiæ*), the ova are actually fecundated during their passages through the cloaca, and developed outside of the parent animal.

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* Wherever the animals are attached below stones or boards, etc., the tubes being directed downwards, the viscid fluid containing the fecundated ova necessarily sinks to the ground, or is carried away by the current of the water.

† Ueber die Entwicklung der Ascidien; Joh. Müller's Archiv. Berlin, 1852, p. 312.

The viscid fluid containing the ova deposited at the base of the tubes, of a light orange-color, had assumed, in passing through the cloaca, a threadlike appearance, irregularly folded and glued together, as represented. On the following day it had lost its folded appearance, and resembled the external envelope, "couche tegumentaire commune;" (Milne Edwards.) This substance, which appeared at first whitish when the sun was shining upon it, is, as has been already mentioned, of a pale orange-color, which is caused by the yellowish color of the yolk of the mature ova. The vesicular, or cellular bodies embedded in the hyaline gelatinous layer—the future muscular sac, or mantle—are colorless; they are green with the *Phallusiæ* according to Krohn, l. c., and yellow with the *Ascidia intestinalis*, according to A. Kowalevsky.*

The viscid mass had become tough, and its color had changed to ashy gray on the following day; the next day it was contractile; the ova became visible with the naked eye. They were round and of different sizes. After two or three days the largest protruded somewhat above the surface of the common envelope, and presented a circular or oval aggregation, like that of the *Mammariæ* found a year ago. The external envelope of the ova had assumed the characteristics of the mantle. The pigment had much increased. After an interval of four or five days, on the eleventh day after the ova were ejected, I found ova still of a round form, increased in size, with a central round or oval orifice through which the motion of the ciliæ of the branchial meshes were visible. The large orifice, without a tube, led directly into the branchial sac, which formed a greater portion of the body of these evidently young *Mammariæ* than in those found during the previous year, with terminal openings, and I found, at this stage of development, the embryo within its chorion. The orifice had approached, on the 1st of August, more or less, one apex; in some specimens—which were now oval—it was terminal.

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* **Entwicklungsgeschichte der einfachen Ascidien. Mémoires de l'Académ. des Sc. de St. Petersbourg; vii. Série, tom. x., No. 15, 1866.**

In my notes taken at the time (1851), no doubt is expressed as to the identity observed soon after they were ejected, and examined for three successive days, and those observed subsequently, until a central orifice was formed containing one embryo.—(Of the microscopical examination of the morphological changes taking place inside, which led to no satisfactory results, I refrain from giving any details). Having established the fact that the *Mammariæ* are nurses, it is certain that a change of generation takes place with the *Molgulæ.* That there is such an occurrence in nature as a change of generation was discovered by Chamisso,* viz., with the *Salpæ.* His observations in regard to this subject were considered for years as contrary to the laws of nature, but were proved to be true and introduced into science by Steenstrup,† who deduced from them, and from analogous observations among the lower animals, laws now generally recognized.

In 1857 I found the calices of the ovaries filled with mature ova on the 12th of August, and on the 23d of the same month young *Mammariæ*, where I had found them before, viz., on the mantle at the base of the tubes—with reference to the time of their development—two days earlier than in 1851, a difference accounted for by the temperature of the respective years.

I have delayed the publication of the results of my investigations, desiring again to study minutely, and at short intervals, the ova from the time of ejection to that of the formation of the embryo, but have had no opportunity of doing so.

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* **De animalibus quibusdam e classe vermicem Linæana. Fascic. I. de Salpa Berolini 1819.**

† **Ueber den Generationswechsel oder die Fortpflanzung und Entwicklung durch abwechselnde Generationen, eine eigenthümliche Form der Brutpflege in den niederen Thierklassen. Kopenhagen 1842.**

Explanation of Plate 3.

Fig. 1. Represents: Molgula Manhattensis, of natural size.
2. The test has been removed; left, or neural side.
3. Test removed; right or hæmal side.
4. Mammaria with embryo; test removed.
5. Larvæ, Diam. 300.
6. Piece of the branchial sac.

Explanation of Lettering.

b. t.	Branchial tube, with six-lobed orifice.
a. t.	Anal tube, with four-lobed orifice.
n. g.	Nervous ganglion.
n. r.	Nervous ring.
b. s.	Branchial sac.
c. s.	Circular sinus.
b. v.	Branchial bloodvessels.
s.	Stomach.
l.	Liver. (?)
i.	Intestinal canal.
r.	Rectum.
cl.	Cloaca.
l. o.	Left ovary.
r. o.	Right ovary.
h.	Heart.
s. c.	Saccus calcareus.
c.	Calyx.
ov.	Oviduct.
p.	Pericardium.
s.	Sediment in the Saccus calcareus.
f. m.	Fibrous membrane.
c. m	Circular muscles.
t. m.	Transversal muscles.
l. m.	Longitudinal muscles.
e.	Embryo.
f. c.	Fat cells.
r. o.	Rudimentary organs enclosing the heart.

VI.—*Notes on North American* CRUSTACEA, *in the Museum of the Smithsonian Institution. No. III.*

BY WILLIAM STIMPSON, M.D., CORRESPONDING MEMBER.

Read October 2d, 1871.

THE publication of these notes has been discontinued for many years,[1] owing to various unfavorable cirumstances, among which may be mentioned the destruction by fire of some of the author's manuscripts and materials, and want of opportunity of access to the rest. It is proper to state that some of the descriptions here following were written more than ten years ago, and have not been revised.[2]

Herbstia pubescens, nov. sp.

Body covered with a dense short pubescence, beneath which the carapax is smooth and unarmed, except at the sides, where there are a few minute spines. There are two inconspicuous tubercles in the median line on the gastric region, and a short, transverse, tuberculiform ridge between the gastric and the cardiac region, which latter is somewhat prominent. There is a single small triangular tubercle at the posterior extremity, on the intestinal region. Rostrum very short. Chelipeds with the meros and carpus armed with spiniform tubercles; hand smooth, unarmed; fingers not gaping (in the female and young male). Ambulatory feet unarmed, pubescent; dactyli very short.

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[1] For No. I. see Annals of the Lyceum, Vol. VII. (1860), pp. 49–93; No. II., same vol., pp. 176–246.

[2] Since these pages were placed in the hands of the printer, the remainder of these materials were involved in the disaster of the great fire of Chicago. The manuscript descriptions of the North American Schizopods, Stomapods, and Tetradecapods, intended to form a part of the present paper, with numerous drawings and the specimens upon which they were based, were all burnt in this third and finally complete destruction of the author's scientific property.

Length of carapax in a female, 0.85; breadth, 0.67 inch.

It differs from *H. condyliata* in its shorter, broader, and smoother carapax, and smooth hand. From *H. pyriformis* (*Rhodia pyriformis* Bell) in its shorter rostrum, and in the spines of the lateral margins of the carapax, which are smaller and more numerous.

Found at Manzanillo, West Coast of Mexico, by J. Xantus, Esq.

This species would come under the group named as a genus, *Rhodia*, by Bell. This can scarcely be considered as distinct from *Herbstia*, the only important differences being those of the chelipeds.

Herbstiella, nov. gen.

This name is proposed for a group of small crabs allied to *Herbstia*, which it resembles in form, but differs in having a strong tooth on the inferior margin of the orbit between its external angle and the base of the antennæ; and in having three teeth instead of two on the outer side of the basal joint of the antennæ. It also differs in its longer chelipeds and spinous meros-joint of the ambulatory feet.

Herbstia depressa Stm., which inhabits the Caribbean Sea, may be considered as the type of the genus. *Herbstiella.* It also includes *H. Edwardsii* Bell, from the Gallapagos Islands, and two new species described below.

Herbstiella depressa.

Herbstia depressa Stimpson, Notes on N. American Crust., p. 57 (Annals Lyc. Nat. Hist. N. Y., VII (1860) 185).

In the description of this species quoted above, the præorbital teeth, orbits, and antennæ are by a slip of the pen stated to be "nearly as in *H. condyliata*" instead of "nearly as in *H. parvifrons*," which was intended; the species alluded to as

"*H. parvifrons*" being that described below under the name *Herbstiella camptacantha.*

Herbstiella camptacantha, nov. sp.

Herbstia parvifrons Stimpson, Notes on N. American Crust., p. 57 (Annals Lyc. Nat. Hist. N. Y., VII (1860), 185); not of Randall.

A more careful consideration of the terms of Randall's description of *H. parvifrons* (Jour. Acad. Nat. Sci. Phila., VIII. 107) leads me to believe that the species noticed by me under that name cannot be the same as that meant by that author.

In *H. camptacantha* the carapax is but slightly convex, and the surface is very regularly and conspicuously punctate. The cervical suture is deep and well marked, but the sulci separating the branchial from the cardiac regions are very shallow, and there is no sulcus whatever between the branchial and the rather flattened intestinal region. There are twenty small tubercles on the carapax, not including the marginal spines. Of these tubercles there are five on the gastric region, four of which are arranged in a transverse line across the middle, the two on either side being approximated; three on the cardiac region, two on the intestinal, and five on each branchial region. On the margin of the carapax on each side behind the orbit, there are fourteen spines; five on the antero-lateral and nine on the postero-lateral margin. The posterior spines are very small, blunt, or tuberculiform; but the anterior ones are larger, and, like the spines on the legs, abruptly bent at the tip, so that they have a truncated appearance, with the sharp apex pointing forward. There is a similar spine and two smaller ones on the subhepatic region; and the oblique ridge separating the pterygostomian from the subhepatic region is armed with five spines, the anterior three being small and tooth-like. The horns of the rostrum are rather large and divergent; they form considerably more than half the length of the rostrum, and their tips as well as those of the antennal spines are bent inward. All of the spines are much more acute in young specimens than in adults. The chelipeds are long, and the meros-joint is armed with numerous (about 13) blunt spines on the outer side; the carpus is tuberculated above; the large and compressed hand is perfectly smooth, and unarmed above and below; the fingers are less than half as long as the palm, and gaping; and the dactylus bears a strong truncated tooth at the middle. In the ambulatory feet the meros-joint is armed with seven to ten spines along the upper edge, and two or three below near the extremity; the carpus is slightly tuberculated, and the penult joint unarmed.

The adult male specimens before me are entirely naked, but young and female specimens are frequently pubescent. Possibly the adult males may have been accidentally denuded.

Dimensions of an adult male: Length of carapax, 0.675; breadth, 0.57 inch.

It was found at Cape St. Lucas by Mr. John Xantus, and there are specimens in the Museum of Comparative Zoology taken at Acapulco by Alexander Agassiz, Esq.

Herbstiella tumida, nov. sp.

The following description is that of a female: Body and feet pubescent. Carapax convex, with the regions more protuberant than in the other two species. There are indications of tubercles on the upper surface, distributed as in *H. camptacantha*, but they are faint protuberances rather than tubercles, except the two on the intestinal region, which are small but distinctly prominent. There is a minute sharp spine at the anterior end of the branchial region and one on the hepatic region. On the antero-lateral margin there are no distinct spines, but the rounded surface is covered with minute, sharp tubercles. On the postero-lateral margin there are about ten minute spines, the anterior one largest. The horns of the rostrum are small, acute, and placed close together; they form rather less than half the length of the rostrum. Basal-joint of the antennæ short and broad, with a sharp projection at the insertion of the movable part of the antennæ not seen in *H. camptacantha;* antero-exterior spine straight, acute, and pointing obliquely outward; the other spines shorter than in the allied species. In the chelipeds the meros-joint is armed above with eight acute spines; carpus with one minute spine above and a slight crest on the outer side; hand unarmed; fingers little gaping;

dactylus without tooth. Ambulatory feet with ten long, slender spines above and two or three below.

Length of carapax, about half an inch.

Found at Manzanillo (West Coast of Mexico), by John Xantus, Esq.

Notolopas, nov. gen.

Carapax pyriform; back with a flattened area on the posterior half, enclosed by a ridge which posteriorly becomes a broad concave lamella, occupying the entire width of the carapax and projecting over its posterior extremity. Rostrum long, bifid; horns divaricate. There is a præorbital spine of moderate size, and behind the eye a strong triangular lobe extending slightly beyond the tip of the eye, and somewhat excavated in front, forming part of the orbit, which, however, is not completed below. The external antennæ are not concealed beneath the rostrum, and the basal joint is broad, with a lobed laminiform expansion at the outer side; coxal joint with a small but prominent tooth on the outer side. Outer maxillipeds of the form usual in the Pisinæ; meros-joint with no distinct notch for the reception of the palpus. Ambulatory feet cylindrical; dactyli very strong, curved, and nearly as long as the penult joint. Male abdominal appendages of the first pair somewhat flattened, reaching to the last segment of the abdomen, and tapering very little toward the extremity, which is truncate and expanded, with a fold on the outer and a small slender hook on the inner side.

This genus resembles in general appearance some of the genera of Acanthonychidæ rather than those of the *Pisa* group, in which the characters of the orbital region would lead us to place it. It differs, however, from *Halimus* and *Pugettia* in the strong post-ocular lobe excavated in front, and from *Halimus* also in the non-expanded penult joint of the ambulatory feet. From *Acanthophrys* A. M. Edw. it differs in its exposed external antennæ. The posterior lamelliform expansion of the carapax will distinguish it at a glance from most if not all other genera of Maioids.

Notolopas lamellatus, nov. sp.

Body and limbs pubescent. Carapax with an erect spine and two tubercles on the gastric region, and a strong spine on each branchial region, on the ridge near the outer end of the laminiform expansion of the posterior extremity, which has a triangular tooth at the middle. Rostrum half as long as the post-frontal part of the carapax. From the antero-exterior angle of the buccal area a crest passes backward, defining the pterygostomian region, which crest is armed with two teeth, the anterior one largest. There is also a crest on the sub-branchial region, along the bases of the feet, ending anteriorly in a projecting tooth.

Length of carapax in a male, 0.63; breadth, 0.35 inch.

Found at Panama by Capt. J. M. Dow, and at Manzanillo by John Xantus, Esq.

Tyche lamellifrons.

Tyche lamellifrons Bell, Trans. Zool. Soc., II. 58; pl. xii., f. 3.

Found at Cape St. Lucas by John Xantus, Esq.

Acanthonyx Petiveri.

Acanthonyx Petiverii H. Milne-Edwards, Hist. Nat. des Crust., I. 343.

This is one of the few species which inhabit the shores of both sides of tropical America. We have it from St. Thomas, collected by A. H. Riise, and from Cape St. Lucas by John Xantus.

Podonema vestita. nov. sp.

This is the first species of the genus which has been reported from the Western coast. It differs from all of the East coast species in its more hairy body, shorter ambulatory feet, and notched outer lamina or crest of the basal joint of the antennæ. The sternum and basal joints of the feet are vermiculated. The penult joint of the ambulatory feet is somewhat thickened in its distal half.

Length of the carapax in a female, 0.52; breadth, 0.42 inch.

Found at Cape St. Lucas by John Xantus, Esq.

Eupleurodon, nov. gen.

Allied to *Epialtus*, but with a depressed and uneven carapax. The antero-lateral angles of the carapax are strongly prominent, forming projecting teeth directed forward, almost parallel to the axis of the body. The ambulatory feet are strongly prehensile, with dentigerous penult joints. The size is small.

Eupleurodon trifurcatus, nov. sp.

Carapax with a profound depression in front of the gastric region, and one on either side of the cardiac, which with the gastric region forms a prominent median ridge. Branchial region depressed, with a tubercle near the postero-lateral angle. Teeth and prominences of the carapax generally setose. Rostrum half as long as the post-frontal part of the carapax, and one-third as broad as long, flattened, truncate, and emarginate at the extremity. Tooth of the antero-lateral angle half as long as the rostrum and curving forward: the distance between the tips of these teeth equals the greatest width of the carapax, and is one-third greater than the middle width. There is a small tooth on the lateral margin behind the antero-lateral angle. Orbital margin arched but not toothed. Feet with an angular or dentated carpal joint.

Of this species I have seen only one specimen, a female, the dimensions of which are: Length of carapax, 0.31; breadth, between tips of antero-lateral teeth, 0.25 inch.

Found at Cape St. Lucas by John Xantus, Esq.

Lambrus excavatus, nov. sp.

This species resembles *Parthenope* in general appearance. The carapax is irregularly hexagonal, and one-sixth broader than long. Antero-lateral margin concave, and forming an angle with the outer lateral margin, which is nearly straight and parallel with the axis of the body, and terminates posteriorly in a strongly projecting angle. The postero-lateral margins are slightly concave, and form a very obtuse angle with each other on account of the little projection of the intestinal region. The periphery is armed with teeth, which are short, triangular, and regularly approximated on the antero-lateral and outer lateral margins, but are longer, more spiniform, and irregularly arranged on the postero-lateral margins. On the upper surface, besides the usual depression between the cardiac and branchial regions, there are four deep excavations in front of the latter region;—two separating it from the hepatic, and two, somewhat larger, from the gastric region. There is also a deep concavity on the frontal region, which is continued posteriorly for a short distance on the gastric region. The rostrum is large, regularly triangular, and deflexed to a right angle with the general level of the gastric region; margin unarmed, or only obscurely toothed. The surface of the protuberant parts of the carapax is covered with low, granulated tubercles. The chelipeds are much shorter and stouter than in the typical forms of the genus, and are deeply concave above, the concavity being smooth or nearly so, and defined by prominent marginal crests, which, except on the carpus, are strongly toothed. The meros-joint of the cheliped is particularly short; its anterior crest is armed with three or four teeth, and its superior one with only two large teeth, the outer one of which is much the largest. In the hand, the crest of the superior margin is armed with six unequal, approximated, triangular teeth; and that of the outer margin with two conical distant teeth, besides the knob at each extremity. The lower surface of the hand is ornamented with four or five rows of granulated tubercles, those of the middle row being largest and most conspicuous; inner margin serrated with granulated teeth. Ambulatory feet much compressed, and crested above. In the female abdomen each segment is armed with short setose tubercles, there being a larger ridge-like one, equalling in extent the length of the joint, in the middle, and four or five small ones on each side.

Length of the carapax in a female, 1.20; breadth, 1.38 inch; proportion 1:1.15; length of meros-joint of cheliped, 0.68; length of greater hand, 1.20 inch.

It is distinct from all other known species with the carapax broader than long, in the shortness of its chelipeds. In one of the specimens before me the right hand is nearly twice as broad as the left.

Two specimens were collected at Manzanillo, Mex., by John Xantus, Esq.

Lambrus hyponcus, nov. sp.

The carapax is subrhomboidal in shape, the posterior region being well developed and prominent, as in *L. angulifrons.* There is one low tubercle on the gastric region, two large, prominent ones on the cardiac, one small, spiniform one on the posterior margin at the median line, and two rather large ones on the branchial region, the posterior one of which is the taller, and situated close to the postero-lateral margin. Besides these tubercles, there are several other, minute ones, roughly arranged in eight or ten longitudinal rows, and the general surface is covered with punctures, crowded together. There are two or three small pits in the depression between the branchial and gastric regions. The antero-lateral margin behind the cervical sulcus is armed with eight triangular, denticulated teeth, the posterior one being but little longer than the others, which are equal in size. Front smooth. Rostrum of moderate size, subtriangular, deflexed; sides slightly concave, unarmed; apex obtuse. Chelipeds long; surface smooth above, except that of the meros, which has a median tuberculated ridge; edges of meros, carpus, and hand armed with small teeth, which, on the superior edge of the meros, are spiniform; outer edge of hand with sixteen teeth alternating in size. Below, the chelipeds are smooth and glabrous except the inner edges, which are tuberculated; the tubercles being small. Sternum with a strongly prominent, almost capitate tubercle on each side at the base of the chelipeds, which also bears a small tubercle on the basal joint; these four tubercles are somewhat flattened at the top and bent forward. In the female abdomen the segments are each armed with a transverse ridge, more or less developed; on the second and third joints this ridge is strongly toothed, and on the penult joint it appears in the form of a median tubercle.

Of this species there is but one specimen in the collection, a sterile female, the dimensions of which are: Length of the carapax, 0.60; breadth, 0.68 inch; proportion, 1:1.133; length of meros of cheliped, 0.60 inch.

Found at Panama by Capt. J. M. Dow, to whom the Institution is indebted for this and many other interesting species.

Lambrus depressiusculus, nov. sp.

Body depressed, though much less so than in *L. crenulatus.* Carapax one-fifth broader than long; regions moderately prominent, the cardiac region most so; surface covered with scattered, granulated tubercles, irregular in size. Branchial region broadly expanded. Lateral margin armed with about fourteen spiniform, granulated teeth, largest on the outer side of the branchial region; at the postero-lateral angle they are as long, or longer, than the rostrum. The intestinal region is broad, and projects but little beyond the line of the postero-lateral angles. Of the fourteen lateral teeth mentioned above, only five properly belong to the postero-lateral margin. The frontal region is concave. The rostrum is small, triangular, and horizontal. Chelipeds of the usual length; superior surface of the meros with a median row of about five spiniform tubercles; margins of both meros and hand armed with numerous spiniform teeth, of which there are about ten on the outer side of the hand. All these teeth of the chelipeds are granulated like those of the carapax, but not ramose. Beneath, the hands are ornamented with longitudinal rows of small, smooth tubercles, largest along the inner edge, and fading out toward the exterior margin. Ambulatory feet slightly compressed, but not crested, and perfectly smooth and unarmed. There is a small, slender spine on the penult joint of the abdomen in the male.

Length of the carapax in a male, 0.85; breadth, spines included, 1.15 inch; proportion 1:1.35; length of hand, 1.13 inch.

Found at Manzanillo, Mex., by John Xantus, Esq.

Solenolambrus arcuatus, nov. sp.

Carapax short and broad, with projecting lateral angles. Surface punctate, much more finely than in *S. typicus.* Antero-lateral margin long and convex. The two antero-lateral margins together would form a regular arc were it not for the projection of the rostrum. The postero-lateral margin is concave, and the posterior margin short and slightly convex. The antero-lateral margin is armed with eleven tridenticulate teeth, little projecting; the middle ones broadest. Protuberances of carapax like those of *S. typicus*, but stronger; their ridges crenulated. Gastric and cardiac protuberances very tall, with strongly projecting apices, which are almost spiniform but not acuminate. Ridge of branchial region convex forward, and crenulated, with a larger toothlet at the middle. Basal joint of the external antennæ shorter than the next joint. Eyes very small. Afferent and subhepatic channels very deep; the ridge separating them being prominent and very thin and sharp. No supplementary ridge on the subhepatic region. External maxillipeds with hairy margins, and with a tubercle near the inner summit of the ischium; antero-exterior angle of the meros less acute and prominent than in *S. typicus;* meros with three or four strong tubercles on the external oblique ridge. Sternum between the chelipeds concave, without tubercles. Chelipeds rather short; meros seven-toothed before and behind; carpus with five denticulated crests; hand with nine strong, subspiniform teeth on the superior crest, and the same number of tuberculiform teeth on the outer and the inner edge of the lower surface; on the inner edge the teeth are minute toward the base, but are large on the outer half of the hand. The surface of the hand between the toothed crests is smooth; the inferior surface, and the interstices of the teeth of all three of the crests, are pubescent. The hand is expanded in width at the distal extremity, and the dactylus when retracted is exactly at right angles with the palm. Ambulatory feet compressed, glabrous; meros-joints with acute, sparsely ciliated superior edge; meros of the posterior pair obtuse below, without crest. Abdomen smooth.

Length of carapax in a female specimen, 0.40; breadth, 0.52; length of meros-joint of cheliped, 0.31; length of hand, 0.37 inch.

Taken at Panama by Capt. J. M. Dow.

Heterocrypta, nov. gen.

The type of this genus is the *Cryptopodia granulata* of Gibbes, which approaches *Solenolambrus* in its characters, and differs greatly from *Cryptopodia* in the want of a posterior expansion of the carapax, and in the existence of a ridge on the pterygostomian region defining the afferent passage.

H. granulata inhabits the seas of the Southern States and of the West Indies.

Heterocrypta macrobrachia, nov. sp.

Body depressed. Carapax narrower and less triangular than that of *H. granulata,* but resembling it in its granulated ridges and protuberances. Antero-lateral margin regularly convex, and crenulated with fourteen or fifteen teeth which are themselves denticulated. Margin between the lateral angle of the carapax and the projecting terminus of the branchial ridge profoundly concave. Posterior margins crenulated like the anterior, with a somewhat larger tooth on each side at the juncture of the posterior with the postero-lateral margins. Exognath of the external maxillipeds not tuberculated. Chelipeds very long, smooth, and naked above, except at the crenulated edges. Ambulatory feet compressed; meros-joint with sharp, minutely denticulated lower edge.

Color yellowish; sometimes with bluish-gray patches on the carapax, and bands of the same color across the chelipeds.

Dimensions of a male: Length of carapax, 0.56; breadth, 0.60; length of meros of chelipeds, 0.46; length of hand, 0.55 inch.

It differs from *H. granulata* in its longer chelipeds, and more strongly toothed margins of the carapax.

Taken at Panama by Capt. J. M. Dow.

CANCROIDEA.

Liomera cinctimana.

Carpilius cinctimanus Adams and White, Voy. Samarang, Crust., p. 37; pl. vii, fig 4.

Liomera cinctimana Dana, U. S. Expl. Exped., Crust., I. 161. A. Milne-Edwards, Nouv. Arch. du Mus., I. 219.

The dactylus of the ambulatory feet is white, with a red base and black tip.

This species, like the next, is one of the few Indo-Pacific forms which have thus far occurred on the west coast of America. It was found at Cape St. Lucas by John Xantus, Esq.

Liomera lata.

Liomera lata **Dana, U. S. Expl. Exped., Crust., I. 161; vii. 6. A. Milne-Edwards, Nouv. Arch. du Mus., I. 220.**

Our specimens are somewhat broader than those figured by Dana. Color light-red. Lateral extremities of carapax in the male white. Pterygostomian regions white. Fingers of hand black with white tips. Dactylus of ambulatory feet with a broad white ring at the middle.

The dimensions of a male specimen are: Length of carapax, 0.41; breadth, 0.74 inch. Of a female: Length of carapax, 0.48; breadth, 0.90 inch.

These specimens were found at Cape St. Lucas by John Xantus, Esq.

Actaea Dovii, nov. sp.

Very closely allied to the West Indian species *A. setigera*, but differing in the granulation of the carapax, which is finer and more dense, and on the posterior regions more distinct.

Dimensions of a male: Length of carapax, 0.45; breadth, 0.63 inch.

Found at San Salvador by Capt. J. M. Dow, and at Panama, by Alex. Agassiz, Esq.

Actaea erosa.

Actaea erosa **Stimpson, Notes on N. American Crust., p. 5.**

The raised parts of the surface of the carapax, between the small cavities, are conical or ridge-like, and roughened. The lobes of the antero-lateral margin are not distinctly defined, with the exception of the posterior one, which is small, triangular, and projecting.

This species differs from the *Xantho vermiculata* of H. Milne-

Edwards, judging from the description in the "Histoire Naturelle des Crustacés" in sculpture;—the surface of the carapax is not "couverte de petits tubercles soudés entre eux par doubles rangées." Also, the notch of the meros of the external maxillipeds is not at the *middle* of the anterior margin. Milne-Edwards gives no locality for his *vermiculata.*

Alphonse Milne-Edwards regards this species as belonging to the *Xantho*-group.

Xanthodes Xantusii, nov. sp.

In this small species the carapax is smooth on the middle and posterior portions of its surface, but in front it is areolated and roughened with somewhat squamiform granules and slight transverse crenulated ridges. The antero-lateral margin is armed with four teeth, not including the angle of the orbit, between which and the first tooth there is a granulated concavity. Front little projecting, and bordered by a thin lamella; outline of lobes somewhat concave. Fissures of orbit very slight. Subhepatic region irregularly granulated. Basal joint of the external antennæ short, scarcely reaching the process of the front. In the chelipeds, the carpus and hand are strongly granulated above and on the whole outer surface; carpus with a deep sulcus near and parallel to its extero-anterior margin; hand with three slight longitudinal sulci, one on the upper and two on the outer surface. Smaller cheliped sparsely short-setose. Ambulatory feet setose and roughened above with minute asperities.

The dimensions of a male specimen are: Length of carapax, 0.25; breadth, 0.35 inch.

It resembles somewhat *X. granosimanus* Dana, a Polynesian species, but the carapax is narrower and more convex, and the lobes of the front are concave instead of convex.

It is very common at Cape St. Lucas, judging from the large number collected by Mr. John Xantus.

Xanthodes insculpta, nov. sp.

Very small. Carapax naked, areolated; anterior areolets rather strongly protuberant. Surface very minutely granulated. Antero-lateral margin with five teeth, including the angle of the orbit, which is about equally prominent with the other teeth. There is generally a minute denticle or two in the interval between the teeth. From the posterior tooth a slight transverse ridge extends inward across the branchial region. Front rather broad; median and lateral sulci deep; margin of lobes convex. Orbital margin smooth, or simply granulated; fissures very slight, except the extero-inferior one. A slight ridge on the subhepatic region extending forward from the second antero-lateral tooth. Chelipeds with large tubercles or projections, five or six on the carpus, and nine or ten on the hand; outer surface of the hand with a slight median ridge and obsolete transverse ranges of minute granules.

Of this species I have seen only one specimen, a male, perhaps immature, the dimensions of which are: Length of carapax, 0.12; breadth, 0.17 inch.

The specimen was found at Cape St. Lucas by Mr. John Xantus.

Menippe Rumphii.

Cancer Rumphii Fabr., Suppl., 336 (?). Herbst, Naturg. d. Krabben u. Krebse, III, xlix., 2.

Menippe Rumphii De Haan, Fauna Japonica, Crust., 21; Dana U. S. Expl. Exped., Crust., I., 179. Smith, Trans. Conn. Acad. II. 34.

Pseudocarcinus Rumphii H. Milne-Edwards, Hist. Nat. des Crust., I. 408.

Menippe nodifrons Stimpson, Notes on N. American Crust., p. 7.

In this species, as in *M. obtusa*, there is a striated area on the inner surface of the hand, but it is far less developed than in that species, and the striæ are much finer and more closely set; in some specimens they are scarcely perceptible.

The description of Fabricius does not apply, in all respects, to our species; as, for instance, " carpi vix unidentati " and " frons margine quadridentata."

H. Milne-Edwards, and the older authors generally, give the East Indies as the habitat of the species, but White and Dana refer it to the West Indies and Brazil. In the Smithsonian Museum there are specimens from Florida (Wurdemann), Jamaica (C. B. Adams), and St. Thomas (A. H. Riise).

Micropanope latimana, nov. sp.

Carapax moderately convex, naked, smooth, and polished, except toward the anterior and antero-lateral margins, where it is somewhat granulated. Front rather broad, and little projecting; lobes with straight margins. Subhepatic region minutely granulated. Chelipeds large and angular; hands broad, smooth, and polished, strongly protuberant at the postero-inferior angle; palm broader than long; fingers nearly as long as the palm, deflexed, and black; the black of the propodal finger extends on the palm for one-third its length. The hands are unequal, and the fingers of the smaller one are longer and more deflexed than those of the greater one, which gives the smaller hand a more angular form and a deeply concave inferior outline. Ambulatory feet slender, smooth, and sparsely hairy.

Dimensions of a male: Length of carapax, 0.28; breadth, 0.38 inch.

Found at Cape St. Lucas by John Xantus, Esq.

Micropanope cristimana, nov. sp.

Carapax convex, smooth posteriorly, and with a transverse ridge, interrupted at the middle, on the gastric, and one on each hepatic and branchial region. Front convex, rather strongly projecting at the middle, where there is a deep sinus, from which arises a deep furrow extending backward to the gastric region. Posterior lateral tooth rather more prominent than in *M. latimana.* Hiatus of outer side of orbit almost entirely obsolete. Inferior inner tooth of orbit large. Basal joint of the external antennæ very short. Chelipeds large, smooth, and polished; carpus with one tooth at the inner angle, and a short crest, bordering a depressed area, at the outer angle; hands very short and broad, and compressed, especially above, where a smooth crest is formed; posterior outer extremity of hand protuberant and bituberculate, the tubercles being most conspicuous in the greater hand. Fingers black, with white tips; those of the smaller hand much deflexed and longer than the palm. Ambulatory feet rather compressed and faintly crested above; dactyli pubescent.

Dimensions of the carapax in a male: Length, 0.22; breadth, 0.27 inch.

Cape St. Lucas. J. Xantus.

Micropanope caribbaea, nov. sp.

Carapax somewhat pubescent, with two or three transverse raised lines, or slight pubescent ridges, on the gastric and on each branchial region. Frontal and gastric regions nearly smooth. Front rather prominent, nearly horizontal; margin straight; median sinus slight. Flagellum of the external antennæ as long as the front is broad. Chelipeds obsoletely granulated; carpus with four or five tubercles above, and a tooth at the inner angle; hand unarmed, but with two slight parallel longitudinal ridges on the upper side. Ambulatory feet smooth, slightly pubescent.

The dimensions of the carapax in a male specimen are: Length, 0.16; breadth, 0.22 inch.

Found at St. Thomas, by A. H. Riise, Esq.

Chlorodius occidentalis nov. sp.

This species represents on the West Coast the *C. floridanus* of the Caribbean Sea. Like many other West Coast crabs, it differs from its eastern analogue in its broader and less convex carapax. The antero-lateral teeth are less prominent than in *C. floridanus*, the second tooth in particular being broader and much less acute. The median lobes, or teeth of the front, do not project beyond the lateral ones.

Dimensions of a male specimen: Length of carapax, 0.45; breadth, 0.74 inch.

Found at Panama by Alex. Agassiz, Esq., and at Manzanillo, Mex., by Mr. John Xantus.

Panopeus planissimus.

Xantho planissima Stimpson, Notes on N. American Crustacea, p. 77.

The reception of several specimens of this species of larger size, and more perfect than those first obtained, gives an opportunity for a re-examination of its characters, which leads me to refer it to the genus *Panopeus.*

The body and chelipeds are very much depressed. The chelipeds are very large, and the carpus has a groove on the upper surface, running parallel and near to the antero-exterior margin; above this groove there are two tubercles, separated from each other by a short groove placed at right angles with the first.

Dimensions of a male specimen: Length of carapax, 0.34; breadth, 0.53 inch.

Cape St. Lucas.

Pilumnus depressus, nov. sp.

Body depressed; carapax for the most part flattened and naked, but slightly curved, pilose and roughened toward the anterior and antero-lateral margins. Frontal margin spinulose. Margins of the orbits above and below armed with spiniform teeth. Antero-lateral margin with three spiniform teeth besides the angle of the orbit, which, like the next lateral tooth, is bifid. Subhepatic tooth minute. Subhepatic and suborbital regions covered with sharp granules concealed beneath pubescence. Feet pilose and spinulose; spinules shorter than in *P. Xantusii.* Greater cheliped naked and obsoletely granulated on the larger part of its outer surface.

Dimensions of a male specimen: Length of carapax, 0.35; breadth, 0.47 inch.

Cape St. Lucas. J. Xantus.

Pilumnus ceratopus.

Pilumnus ceratopus Stimpson, Notes on N. American Crustacea, p. 87.

Pilumnus? Desbonne et Schramm, Crust. de la Guadeloupe, p. 33; pl. iii, figs. 9, 10.

This species, originally discovered on the Florida coast, was found at Guadeloupe by M. Desbonne.

Pilumnus marginatus, nov. sp.

A very small species. Carapax somewhat hairy, moderately convex, somewhat distinctly areolated, and regularly covered with small equidistant tubercles, between which the surface is very minutely punctate. The posterior extremity is very narrow. The areolets are not protuberant. The median frontal channel is rather deep and conspicuous. The front is broad, very little prominent, and separated from the supra-orbital margin by a small notch; its margin is simply granulated, and there is a slight channel running parallel with it and separating it from the frontal region. The orbital margin is unarmed except by small tubercles or granules, and has a single slight fissure at the middle above. The antero-lateral margin is sharply defined, almost limbed; and is armed with three very slightly prominent teeth, besides the angle of the orbit, and a broad lobe posterior to it, neither of which project beyond the general outline; the three teeth are each composed of two or three denticles, of about the size of the tubercles of the dorsal surface. There is no subhepatic tooth. The ridge of the endostome is almost obsolete. Chelipeds large, granulated; carpus and hand usually covered on the outside with a dense tuft of algoid growth.

Dimensions of a male specimen: Length of carapax. 0 16; breadth, 0.20 inch.

This species is chiefly remarkable for the absence of a subhepatic tooth, and the character of the antero-lateral margin, which approaches somewhat in appearance that of *Pilumnoides*, though much shorter.

Cape St. Lucas: J. Xantus.

Acidops nov. gen.

Carapax broad, smooth, with convex antero-posterior and nearly plane transverse dorsal outline; surface nearly even. Antero-lateral margin short, acute, with three inconspicuous teeth, besides the angle of the orbit. Eyes and orbits elongated, resembling somewhat those of certain Macrophthalmoids. Orbits destitute of teeth or fissures. Eye-peduncles flattened, with an acute anterior edge continuous with that of the margin of the carapax. The basal joint of the external antennæ fills the hiatus of the orbit and just reaches the front. Chelipeds small. Ambulatory feet broad and compressed, except the terminal joint, which is narrow. Abdomen of the male with the third joint much produced on either side. Male appendages of the first pair broadly laminate at base, geniculated at the posterior third of their length, and tapering to a fine point, somewhat incurved toward the extremity, and reaching to the penult segment of the abdomen; those of the second pair two-thirds as long as the first, slender, cylindrical, and tapering to a filiform extremity.

This genus is somewhat allied to *Pilumnus*, but differs greatly in the character of the orbits and eye-peduncles.

Acidops fimbriatus, nov. sp.

Anterior and antero-lateral margins of the carapax ciliated with a fringe of long fine hairs. Carapax covered with a short pubescence, and areolated, the areolets being sufficiently distinct, but not at all protuberant. Angle of the orbit and next tooth of the antero-lateral margin about equal in size; the other two teeth very small. Subhepatic region smooth. Front not prominent; median sinus slight; lobes very slightly convex. External maxillipeds hairy; meros-joint somewhat swollen. Chelipeds somewhat hairy; hand granulated on the outer side; fingers short, acuminate, and with granulated longitudinal ridges. Ambulatory feet ciliated.

Dimensions of a male specimen: Length of carapax, 0.21; breadth, 0.28 inch.

This little crab resembles *Ceratoplax ciliatus* in appearance.

Cape St. Lucas. J. Xantus.

Acheloüs transversus, nov. sp.

Carapax broad; regions only slightly protuberant; ridges distinct, granulated; branchial ridge sinuous, but only slightly convex, curving forward even less than in *A. Gibbesii* and scarcely more than in *Callinectes*, but nevertheless forming an angle near the base of the lateral spine. The oblique meso-branchial lobes are distinct. The lateral spine is long, as long as the space occupied by the four or five teeth in front of it. The other antero-lateral teeth are pretty strong, equal, and have a granulated surface. Front nearly as in *A. panamensis* described below, but with the teeth somewhat more pointed. Chelipeds rather short; meros four-toothed in front. Meros of the posterior pair of feet with a spiniform tooth at inferior extremity.

Dimensions of a male: Length of carapax, 0.39; breadth., 0.85 inch.

Of this species I have seen only one specimen, which is imperfect, the hands being wanting. It has somewhat the aspect of a *Callinectes.*

It was taken at Manzanillo, Mex., by John Xantus, Esq.

Acheloüs acuminatus, nov. sp.

Body and feet pubescent. Carapax very short and broad; proportion of length to breadth, 1:2.52; surface uneven, but with the protuberances few in number and large, these being on the gastric, cardiac, and inner branchial regions. All the protuberances and ridges are granulated at their summits only. The branchial ridge is convex, bending rather abruptly forward near the base of the lateral spine. This lateral spine is very long, nearly two-thirds as long as the antero-lateral margin. The other teeth are rather strong, the second, fourth, and sixth being somewhat smaller than the others. Front convex, separated from the orbit by deep incisions; median teeth projecting somewhat beyond the level of the outer angles of the orbit; teeth equal, bluntly triangular, moderately deeply cut; median teeth most projecting. A large notch on the margin of the orbit above the insertion of the external antennæ. Chelipeds very long, nearly three times as long as the carapax; meros longer than the carapax, projecting nearly to the middle of the penult joint of the first pair of ambulatory feet, and tapering, and armed with four spines in front; carpus slender, inner spine no longer than the basal spine of the hand; hand very slender, almost sword-shaped, and with strong granulated ridges. A spine on the meros-joint of the posterior pair of feet.

Dimensions of a male: Length of carapax, 0.50; breadth, 1.26 inch.

Found at Panama by Capt. J. M. Dow.

Acheloüs panamensis, nov. sp.

Carapax moderately broad; regions moderately protuberant. Branchial ridge bending very abruptly forward near the base of the lateral spine. Lateral spine as long as the space occupied by the three teeth in front of it. The other lateral teeth are rather strong, and of equal size. Front projecting slightly beyond the level of the angles of the orbits; teeth rather blunt, equally prominent; median teeth smaller than the laterals, and separated from each other by a much deeper and narrower sinus than that separating them from the laterals. Notch of orbital margin over base of antennæ very slight. Chelipeds rather long; meros with four spines in front; inner spine of carpus about twice as long as basal spine of hand; hand of ordinary proportions, if anything rather more slender than usual. A spine on meros joint of posterior feet.

Dimensions of a male: Length of carapax, 0.40; breadth, 0.75 inch. The breadth in this and the two preceding species of *Acheloüs* is measured between the tips of the lateral spines.

It differs from *A. acuminatus* in its narrower carapax, shorter lateral spines, blunter frontal teeth, and thicker hand.

Panama. Capt. J. M. Dow.

Acheloüs anceps.

Lupea anceps De Saussure, Crust. nouv. des Antilles, etc., p. 18; pl. ii, f. 11.

Lupea Duchassagni Desbonne et Schramm, Crust. de la Guadeloupe, p. 39; pl. iv, f. 25.

Specimens from St. Thomas in the Smithsonian Collection agree with the descriptions quoted above in everything except their shorter chelipeds.

OCYPODOIDEA.

Pachygrapsus gracilis.

Metopograpsus gracilis De Saussure, Crust. nouv. des Antilles, etc., p. 27; pl. ii, fig. 15.

Found at Barbados by Professor T. Gill.

Pachygrapsus transversus.

Grapsus transversus Gibbes, Proc. Am. Assoc. Adv. Sci., 1850, p. 181.

Pachygrapsus transversus Gibbes, *loc. cit.*, p. 182.

Metopograpsus dubius De Saussure, Crust. nouv. des Antilles, p. 29; pl. ii, fig. 16.

Found at St. Thomas by A. H. Riise, and at Barbados by Theo. Gill.

Pachygrapsus socius, nov. sp.

Closely allied to *P. transversus*, but differing in several minor particulars. The carapax is somewhat narrower, less convex, and more strongly striated; and the frontal region is more depressed and expanded. The propodal finger of the chelipeds never has the dark patch which is always more or less conspicuous in *P. transversus* and *P. innotatus*.

Dimensions of a male specimen: Length of carapax, 0.63; breadth, 0.725 inch.

There are specimens in the Smithsonian Collection from the following localities: Peru, C. H. Raymond; Panama, Alex. Agassiz; San Salvador, J. M. Dow; Manzanillo, Mex., John Xantus; Cape St. Lucas, John Xantus.

LEUCOSOIDEA.

Calappa convexa.

Calappa convexa De Saussure, Rev. et Mag. de Zoöl., 1853, pl. xiii, fig. 3.
Calappa Xantusiana Stimpson, Notes on N. American Crust., p. 109.

There are specimens in the Smithsonian Collection from Cape St. Lucas (Xantus), Mazatlan (Bischoff), and Panama (Sternbergh).

Osachila acuta, nov. sp.

Carapax depressed between the protuberances, and particularly toward the antero-lateral margins, where it is broadly expanded and concave. Protuberances rather small and somewhat conical; the three on the gastric region equal; all of them tuberculated, and with the tubercles coarsely punctate. Between the large protuberances there are no small ones, but the surface is smooth, naked, and microscopically and crowdedly punctate. The rostrum is flattened, narrow, prominent, and bilobed at the extremity; margin thin and sharp, and at the extremities of the lobes denticulated. Antero-lateral margin acute, arcuated anteriorly but becoming nearly straight and parallel to the axis of the body posteriorly; its armature is variable, but generally there are seven or eight teeth behind the obtuse tuberculated space near the orbit, or rather behind the point where the transverse subhepatic ridge joins the margin; the teeth increase in size posteriorly, and each one is composed of two or three denticles, the median one being largest where there are three. The postero-lateral margin is thickened, as if double; it is irregularly tuberculated, and bears two strong triangular teeth, one next the lateral tooth of the carapax and the other next the posterior extremity. The posterior extremity of the carapax is narrow, with two thickened, tuberculated margins placed one above the other. Beneath, the surface of the body is rough with pits and tubercles both anteriorly and posteriorly; but the subbranchial region is smooth. Chelipeds angular; meros smooth below, and having a transverse, crenulated, laminiform crest at the superior extremity, following the upper part of the base of the carpus; supero-exterior surface of the carpus nearly smooth; superior crest of the hand with three equal teeth; outer surface of hand with five longitudinal ridges, the three upper ridges formed of large, the two lower ones of small tubercles. Ambulatory feet nearly as in *O. tuberosa*, but with the crests less prominent, that of the meros-joint not pitted, but faintly denticulated and sparsely hairy.

Color yellowish, with spots of red and white resembling patches of lichen.

Dimensions of a male: Length of carapax, 0.70; greatest breadth, at the antepenult antero-lateral tooth, 0.83 inch.

There are several specimens of this species in the Smithsonian Collection, which were taken at Panama by Capt. J. M. Dow, and at Manzanillo by John Xantus, Esq.

Lithadia pontifera, nov. sp.

The following description is that of an adult female, the only specimen I have seen. The carapax is rather broader and less convex than in other species of the genus, and has an angular outline, with an aspect somewhat like that of a *Nursia*. The sides project considerably over the bases of the feet. The entire upper surface is granulated. The protuberances of the carapax are smaller than usual, but prominent, and covered with tubercles, or granules, much larger than those on the depressed parts. The branchial protuberance is divided into two, one part being connected by a ridge with the anterior lateral tooth, and the other by a thicker ridge with the posterior lateral tooth. There is a median tuberculated ridge extending from the frontal region to the cardiac, and interrupted at the centre of the carapax. Between the cardiac and the branchial region on either side there is a deep narrow cavity, bridged over by the meeting of a projection from the cardiac region with a similar projection from the posterior branchial protuberance. The hepatic region is not very protuberant above, and bears a short longitudinal ridge. The marginal teeth of the carapax are all prominent, thickened, coarsely granulated, and separated by rather deeply concave intervals. The anterior lateral tooth (that on the branchial region, forming the antero-lateral angle of the body) is very large and prominent, and there is a smaller triangular tooth in front of it, pointing downward. Between this latter and the triangular hepatic tooth there is a deep sinus. The subhepatic tooth is very prominent and tuberculated. The posterior lateral tooth is obtusely rounded. The posterior margin is thinner than the anterior and lateral margins on account of the deep excavation around the cardiac region; the intestinal region is bilobed, but the lobes do not form dentiform projections, the posterior outline being nearly straight when viewed from above, though interrupted at the middle. The front has a deep sinus at the middle, and is somewhat bimarginate. The epistome is very short, and the suborbital region less developed than usual. The external maxillipeds are granulated, with the meros of the endognath much smoother than the other joints. The chelipeds are somewhat flattened, and resemble those of the type, *L. Cumingii;* the outer crest of the hand is rather sharp. The ambulatory feet are granulated and tuberculated; the tubercles not spiniform. The abdomen is densely tuberculated.

Dimensions of the female specimen: Length of carapax, 0·39; breadth, 0·48 inch.

This can scarcely be the *Ebalia mammillosa* of Desbonne and

Schramm, Crust. de la Guadaloupe, p. 54, for that species is described as having the granulations of the chelipeds larger than those of the carapax; the meros of the chelipeds rounded, and both meros and hand without crest; the ambulatory feet simply granulated; and no mention is made of the bridged fossæ between the cardiac and the branchial regions, unless these are what is meant by "trous borgnes," which is not probable. What *E. mammillosa* is will, perhaps, always remain a matter of conjecture, as no specimen was preserved in Desbonne's collection, and no figure was made. It is probably a *Lithadia*.

Found at Barbados by Theodore Gill.

Uhlias, nov. gen.

Closely allied to *Oreophorus*, but differing in its broadly elliptical shape, in the greater expansion of the sides of the carapax, in the non-projecting front, in the concealment of the eyes beneath the orbital margin of the carapax, in the broader and non-tapering exognath of the external maxillipeds, and in the expanded penult joint and short dactylus of the ambulatory feet. The hepatic region is not distinctly defined, and is not toothed.

Uhlias is an American, while *Oreophorus* is an East Indian genus.

Uhlias ellipticus, nov. sp.

Of this species I have seen only one specimen, a female, which may be described as follows: Carapax broad, regularly elliptical, rather depressed; sides much expanded, laminiform; middle of the carapax elevated above the sides, which are depressed. Upper surface, with the exception of the central parts and the lateral expansions, covered with deep, rounded, or elongated pits. The posterior pits are the largest, and six of them, of a pentagonal or rounded shape, are situated on the posterior part of the branchial regions, three on each side. A large, transverse pit occupies the entire width of the intestinal region, following the posterior margin. The pits on the frontal and hepatic regions are elongated in a direction parallel with the longitudinal axis of the body. The entire surface, except the bottoms of the pits, is granulated. The margins are slightly waved, but nowhere distinctly toothed. The front does not project much beyond the regular curve of the anterior outline. The frontal margin is thick, and the eyes are small, and in our specimen are firmly imbedded in their sockets, lying beneath the margin, so as not to be seen from above. The intestinal margin is straight. Feet granulated. Chelipeds short, with a crest on the meros and one on the hand. Ambulatory feet compressed, with a laminiform crest on the meros joint, and two similar crests on the carpus and penult joint; this penult joint is broadly expanded below, forming a process against which the short dactylus retracts; thus giving a subcheliform appearance to the extremities of the feet.

Dimensions of the female specimen: Length of carapax, 0.20; breadth, 0.31 inch.

Found at Panama by Capt. J. M. Dow.

Uhlias limbatus, nov. sp.

Description of an adult female: Carapax broad, subelliptical, rather sharply curved and almost angular at the sides, which are strongly projecting. Upper surface coarsely and closely granulated, and moderately convex, except towards the sides, where it is depressed as in *U. ellipticus.* The cardiac region is surrounded, except in front, by a deep furrow, which posteriorly follows the posterior margin of the carapax. There is also a deep circular pit on the posterior part of the branchial region; but there are no other well-defined pits, although the swollen part of the carapax is surrounded on the sides and in front by a shallow concavity, which deepens at its posterior extremity on the branchial region. The lateral margins are waved, but not distinctly toothed. The posterior margin is slightly convex. Ambulatory feet rather short and stout, not compressed, granulated above and below; penult and antepenult joints somewhat flattened or even concave above, but not crested; penult joint much less expanded below than in *U. ellipticus,* and not forming so distinct a hand; dactyli about equal to the penult joint in length. The chelipeds are wanting in the only specimen I have seen.

The dimensions of this specimen are: Length of carapax, 0.22; breadth, 0.32 inch.

Found at St. Thomas, W. I., by A. H. Riise, Esq.

Spelaeophorus nodosus, A. M.-Edw.

Oreophorus nodosus Bell, Trans. Lin. Soc., XXI, 307; pl. xxxiii, fig. 8.

Spelaeophorus nodosus A. Milne-Edwards, Ann. Soc. Ent. de France, 4e Serie, Tome V, p. 149.

Of this species there is one (female) specimen in the Smithsonian collection. It agrees well with the figure and description of Bell, except that the exognath of the outer maxillipeds does not taper, but is blunt, almost truncated at the extremity, and that the ambulatory feet are less spinous. The postero-inferior marginal lobe is concave in outline, and granulated below; and its lateral angles do not form teeth projecting downward, as in Bell's figure of a posterior view of the male carapax. This latter may be a sexual difference. The soldered segments of the female abdomen have a longitudinal sulcus on either side of the median line, and the lateral surfaces are rugose and pitted, as if eroded.

The specimen was taken at Jamaica by the late Prof. C. B. Adams.

PORCELLANOIDEA.

Petrolisthes eriomerus, nov. sp.

Near *P. rupicola.* Front nearly horizontal. Epigastric lobes rather sharply prominent, more so than in the allied species. The protogastric and epibranchial lobes are also prominent, and there is a channel between them and the orbital and the antero-lateral margins. Front broad, triangular, much less prominent than in *P. rupicola.* Chelipeds (except at the fingers) granulated; carpus rather elongated, with a straight and entire anterior margin destitute of a prominent inner lobe, and a denticulated posterior margin; hand with a tuft of hair between the fingers below. Ambulatory feet everywhere hairy on upper edge. Surface of meros of third pair also hairy. Size of *P. rupicola.*

Found at Mendicino, Cal., by Alexander Agassiz, Esq.

Polyonyx macrocheles.

Porcellana macrocheles Gibbes, Proc. Am. Assoc. Adv. Sci., 1850, p. 171.

This species lives in the tubes of *Chaetopterus*, along with the worm and its other guest, *Pinnixa chaetopterana*, on the coast of South Carolina.

HIPPOIDEA.

Remipes barbadensis.

Squilla barbadensis ovalis Petiver, Pætrigraphia americana, pl. ii, f. 9.

Body oval. Carapax depressed, not narrowed anteriorly; surface nearly smooth, but anteriorly and toward the sides minutely lineolated transversely as in other species. Front broad, undulated, with a single broadly rounded median tooth; margin minutely crenulated. The lateral margins are ornamented with a rather broad marginal stripe, which is transversely striated; striæ setiferous, and not interrupted at the middle as in some species. Inner antennæ half as long as the carapax; the shorter flagellum being scarcely a tenth part as long as the longer one, which is compressed and almost naked.

Length of carapax, 0.84; breadth, 0.69 inch.

Found at Barbados by Prof. Gill, and at Key Biscayne, Fla., by the late Gustavus Wurdemann.

THALASSINOIDEA.

Glypturus.

Glypturus Stimpson, Proc. Chicago Acad. of Sciences, I, 46.

Flagella of the antennulæ much longer than their peduncles. External maxillipeds indurated; meros and ischium not dilated, no broader than the propodus (penult joint), and concave on the outer surface; ischium armed along the middle of its inner edge with a sharp, prominent, spinous crest; carpus thick; and only half as broad as the propodus, which is greatly dilated within, and truncated, but not grooved, at the broad anterior margin, against which the dactylus folds; dactylus rather stout, compressed, and rather longer than the anterior margin of the propodus. Mandibles strong, much indurated; corona with its margin unevenly toothed, deeply cleft within, and with the basal process as broad and half as high as the corona itself, and having also a toothed edge. Appendages to the first two joints of the abdomen in the male nearly similar to the corresponding parts in the female. Caudal lamellæ deeply sculptured. Of the appendages to the penult joint of the abdomen, the outer lamellæ appear as if composed of two pieces soldered together, the outer one of which overlaps the inner; while the inner lamellæ are obliquely triangular. Terminal segment of the abdomen very small.

Glypturus acanthochirus.

Glypturus acanthochirus Stimpson, Proc. Chicago Acad. of Sciences, I, 46.

Dorsal suture very deep. Front bearing an erect spine close to its anterior extremity, and a sharp, curved spine on either side, over the insertion of the outer antennæ. Greater cheliped rather short and stout; ischium, meros, and carpus with their lower edge spinous; meros with two spines above, and no projecting lobe at the base below; carpus much shorter than the palm of the hand; hand much broader than the carpus, with three spines on the upper edge, and a granulated area on the outer surface behind the base of the pollex or immovable finger; dactylus two-thirds as long as the palm of the hand. Smaller cheliped nearly similar to the greater one in shape and armature, but of less than half its size.

In a female specimen, the length of the animal, exclusive of the antennæ, is 3.9 inches; length of the carapax, 1.02; length of carpus and hand taken together, and measured to the end of the dactyius, 1.5 inches.

This species is not uncommon among the Florida Keys. A considerable number of specimens was found at the Tortugas by Dr. Whitehurst.

It cannot be mistaken for any of the Thalassinidea found on our coast, unless it be a species described by Prof. Lewis R. Gibbes under the name of *Callianassa grandimana*, in the Proceedings of the Charleston meeting of the American Association for the Advancement of Science, in 1850. If the description given by that author is correct, however, our species differs from that named by him in having the palm of the hand less than twice as long as the carpus, and in having a granulated area on the outer surface of this palm; as well as in the armature of the lower edge of the greater cheliped.

Callichirus.

Callichirus **Stimpson, Proc. Chicago Acad. of Sciences, I, 47.**

Flagella of antennulæ rather shorter than their peduncles. External maxillipeds soft, coriaceous; meros and ischium compressed and dilated; meros short; carpus and propodus much dilated at the inner margins; propodus larger and more dilated than the carpus, and with a groove in its anterior margin, into which the small, curved dactylus folds. Inner lobes and laciniæ of the second pair of maxillæ for the most part narrow. Mandibles very small and weak, not indurated; internal basal projection only slightly developed. Carpus and hand of the greater cheliped very long. The appendages to the first and second joints of the abdomen in the male are small; those of the first pair having but one branch, while those of the second pair have two branches, the outer branch being minute. Caudal lamellæ much thickened. Inner lamellæ of the appendages to the penult joint of the abdomen very narrow, almost styliform. Terminal joint of the abdomen short and broad, contracted at the base, and emarginated at the extremity.

The type of this genus is the *Callianassa major* of Say (Jour. Acad. Nat. Sci., Philad., I, p. 238). This species is found abundantly on the sandy shores of the Southern States—North and South Carolina, Georgia, Florida, etc. It burrows in the sands about low-water mark, its holes being usually about one foot in depth.

ASTACOIDEA.

Scyllarus nodifer.

Scyllarus nodifer Stimpson, Proc. Chicago Acad. of Sciences, I, 48.

Upper surface tuberculated; tubercles sparsely setose. A strong, bidentate projection on the gastric region of the carapax. On the third segment of the abdomen above there is a very prominent, median knob, which forms the posterior extremity of the body when the abdomen is folded in. The second joint of the antennæ is armed with four or five teeth on the antero-exterior margin—the teeth, with the exception of that at the angle, being little prominent. Fourth joint of the antennæ broader than long, with the margins crenulated, and the antero-exterior angle prominent.

The length of the largest specimen is about five inches. In a male, the length of the carapax is 2.1; and its breadth at the anterior extremity, 1.88 inches. In a female, length of carapax, 1.225; breadth anteriorly, 1.13 inches.

Found among the Florida Keys. The specimens in the Smithsonian Museum were taken at the Tortugas by Dr. Whitehurst, and there are examples from Key West in the Museum of Comparative Zoölogy at Cambridge.

CARIDEA.

Hippolysmata californica.

Hippolysmata californica Stimpson, Proc. Chicago Acad. of Sciences, I, 48.

Surface of carapax and abdomen minutely pubescent. Rostrum short, scarcely over-reaching the ante-penult joint of the peduncle of the antennulæ, and six-toothed above, the posterior tooth being situated at one-half more than the usual interval behind the next tooth, and at about the anterior third of the length of the carapax; below, the rostrum is armed with three minute teeth. On the anterior margin of the carapax there is a strong spine above the base of the antennæ, and a minute one below it. Flagella of the antennulæ equal, and very long, one and a half times as long as the body. Acicles or appendages to the antennæ broad even to their tips, and much longer than the peduncles of the antennulæ. External maxillipeds thickly setose, and reaching the extremity of the acicles. Terminal segment of the abdomen with two pairs of aculei above.

Length, 1.25 inches.

Found at San Diego, Cal., by Mr. Cassidy.

This is the analogue of the Florida species, *H. Wurdemanni* (*Hippolyte Wurdemanni* Gibbes), from which it differs in its longer antennulæ, smaller eyes, etc.

Rhynchocylus parvulus, nov. sp.

Dorsum of the carapax elevated, and protuberant at the middle of its length, its anterior half having a considerable slope forward, and being obtusely carinated and armed with five small, spiniform teeth;—the posterior two teeth being somewhat remote from the anterior three, which are approximated. Rostrum one-third as long as the carapax, rounded-ovate, reaching beyond the tips of the peduncles of antennulæ and the antennal scales, and serrated with six teeth above and three below near the extremity. Antennulæ longer than the rostrum; antennæ as long as the body. The external maxillipeds reach the extremity of the peduncle of the antennæ. Feet of the first pair very short; carpus half as long as the meros, and excavated in front for the reception of the hand. Feet of the second pair with a triarticulate carpus. Abdomen smooth above; caudal segment with two pairs of aculei on the dorsum.

The color in life is unknown to me. Alcoholic specimens are plentifully spotted and blotched with whitish pigment.

Length, half an inch.

Found at St. Joseph's I., Texas, by Gustavus Wurdemann, Esq.

Nectocrangon lar.

Crangon lar Owen, Beechey's Voy., Zoöl., 88; pl. xxviii. f. 1.
Argis lar Kroyer, Tidsskrift, IV. 255; pl. v, f. 45–62.
Nectocrangon lar Brandt, Sibirische Reise, Zoöl., p. 115.

There are specimens in the Smithsonian collection, taken at St. John's, Newfoundland, by Prof. Gill.

Hippolyte picta, nov. sp.

Carapax and rostrum as in *H. sitchaensis* Brandt (Sibirische Reise, Zoöl., p. 116; pl. v, f. 8), the latter reaching a very little beyond the peduncle of the antennulæ, and armed with six teeth above (including two on the carapax) and three teeth below, near the extremity. On the antennulæ the outer flagellum has the slender part only one-fourth as long as the thick part; the inner flagellum is one-half longer than the outer. The external antennæ are one-third longer than the body. The external maxillipeds reach a little beyond the tip of the antennal scale, and are provided with a flagellum or epignath, but have no exognath. Feet of the first pair provided with an epipod; those of the last pair rather long and stout; abdomen smooth; last segment with four pairs of dorsal aculei.

Thorax obliquely streaked with crimson. Length of the largest specimen, 1.33 inch.

It differs from *H. sitchaensis* Brandt in its longer external maxillipeds and non-carinated abdomen. The rostrum is longer than in *H. palpator*, but much shorter than in *H. Layi.*

Found at Monterey, Cal., by A. S. Taylor, Esq.

Hippolyte vibrans, nov. sp.

This species resembles very closely *H. Phippsii* Kroyer (Monog. Fremst. Hippol., p. 106, pl. iii, fig. 65-68), but differs in having but one spine over the eye, and only two or three teeth beneath the tip of the rostrum. The carina of the carapax is sufficiently well marked toward the base of the rostrum.

Found in Massachusetts Bay.

Hippolyte spina.

Cancer spinus Sowerby, British Miscellany, xxi.

Hippolyte spinus White, British Museum Cat., Crust. (1847), p. 76. Bell, British Crustacea, p. 284.

Hippolyte Sowerbei Leach. Kroyer, Monog. Fremst. Hippol., 90; pl. ii, fig. 45–54.

This species is very beautifully colored in life, being generally speckled or mottled with crimson, or bluish; the base of the antennulæ is usually brownish, and the scale of the antennæ blue.

It is common on rocky bottoms, among algæ in the laminarian zone, on the coasts of Maine and Massachusetts. I have several specimens from Grand Manan, where it occurs at low water mark.

Sowerby, by the name he gave to this species, doubtless had reference to a spine, or the backbone; in Latin *spina*, not *spinus*. *Spinus* is not an adjective, and means only the sloe-tree, which could scarcely have been intended. I have, therefore, taken the liberty to modify the name, and all the more willingly because *Hippolyte* is feminine.

Hippolyte Fabricii.

Hippolyte Fabricii Kroyer, Monog. Fremst. Hippol., p. 69; pl. i, f. 12–20.

This species is common in Massachusetts Bay, in which I have often obtained specimens by dredging.

Hippolyte Gaimardii.

Hippolyte Gaimardii H. Milne-Edwards, Hist. Nat. des Crust., II, 378. Kroyer, Monog. Fremst. Hippol., p. 74; pl. i, f. 21–29.

In our specimens the back of the abdomen at the third segment is smoothly rounded; but in Milne-Edwards' description this segment is said to be "moins denté." Our specimens, however, agree perfectly with Kroyer's description and figures.

This species occurred to me on a sandy bottom, covered with dead *Zostera*, in three fathoms, in Boston harbor, and I have found it in other parts of Massachusetts Bay.

Hippolyte pusiola.

Hippolyte pusiola Kroyer, Monog. Fremst. Hippol., p. 111.; pl. iii, fig. 69–73.

This small species is easily distinguished from our other Hippolytes by the smallness of its four-toothed rostrum, which is no longer than the eyes. There is no spine over the eye.

I have found it abundantly in Massachusetts Bay, particularly in Boston Harbor. It also occurred to me at Harpswell, Me. It lives in the laminarian zone, and is most frequent among eel-grass (*Zostera*).

Virbius pleuracanthus, nov. sp.

Back depressed. Rostrum horizontally broad, and smooth at base, acute, about half as long as the carapax, and scarcely more than half as long as the acicle of the antennæ, but reaching to the extremity of the penult joint of the peduncle of the antennulæ, and armed with one or two teeth above, and one below near the extremity. There is a small spine on each side at the base of the rostrum, above and a little behind the base of the ocular peduncles. On the anterior margin of the carapax there is a spine beneath the eye, but no pterygostomian spine. There is a sharp (hepatic) spine on the surface of the carapax behind the base of the antennæ. The scales of the antennæ are very large, as long as the carapax, and rather widening than narrowing toward their extremities. The dactyli of the posterior three pairs of feet are broad, compressed, and knife-like, with the inner edges nearly straight, and armed with minute spines. The dorsal angle of the abdomen at the third segment is very prominent, but not acute.

Length about one inch.

It is easily distinguished from *V. acuminatus* by the great size of the antennal scales, and the presence of an hepatic spine on the carapax.

It was dredged by me in the harbor of Norfolk, Va., in June, 1853; and found abundantly at Somers' Point, in Great Egg Harbor, N. J., in the summer of 1864. It lives among *Zostera* just below low water mark.

Pandalus borealis.

Pandalus borealis Kroyer, Tidsskrift, II, 254; Voy. en Skandinavie et Laponie, Zoöl., Crust., pl. vi, fig. 2.

In this species the feet of the posterior pair reach only to the extremity of the scales of the antennæ. The caudal segment has nine pairs of dorsal aculei, which is another mark by which this species may be distinguished from *P. annulicornis.* It reaches a large size.

Found in Massachusetts Bay.

Pandalus Gurneyi, nov. sp.

A large species, of the same size as *P. borealis,* etc. Surface of the carapax marked with shallow pits in clusters; not pubescent. Rostrum more than one-half longer than the carapax, and unarmed above, except near the base, where the crest has eight or nine teeth, four of which are on the carapax: these teeth are small and rather distant. Below, the rostrum is armed with nine teeth, the two teeth next the base being rather close together, large, and hook-shaped, but not broad. The feet of the third pair are rather short, not reaching the extremity of the rostrum; they terminate in well-formed subcheliform hands.

Found at Monterey, Cal., by A. S. Taylor, Esq. It is named *P. Gurneyi* at the request of its discoverer.

Palaemonetes.

This genus resembles *Palaemon* and *Leander* closely in all its characters, except that the mandibles are not palpigerous. From *Anchistia* it differs in its general form and habit, which are exactly those of *Palaemon,* and in its antennulæ, which are provided with three flagella. It agrees with *Leander* in the spines of the carapax. The species are for the most part inhabitants of fresh or brackish water.

The genus was described by me in manuscript about twelve years ago under the name *Palaemonopsis,* but this name has never before been published, and I believe it to be identical with *Palaemonetes* of Heller, recently described from a species found in the fresh water lakes of Southern Europe. If it should prove distinct, the name *Palaemonopsis* may be retained for it.

Palaemonetes vulgaris.

Palaemon vulgaris Say, Journal of the Academy of Natural Sciences of Philadelphia, I, 248.

This species is very common in the brackish waters of the inlets along our coast, from Massachusetts to South Carolina. I have distributed specimens to European Museums under the name *Palaemonopsis vulgaris.*

Palaemonetes carolinus, nov. sp.

Rostrum of moderate breadth, rather long, reaching a little beyond the extremity of the antennal scale, and curved upward considerably. It is ciliated and serrated above throughout to the tip, with nine teeth; the posterior tooth being a little further removed from the second than the second is from the third, and situated at the anterior third of the carapax; the third tooth is directly above the base of the eye-peduncles. The extremity of the rostrum is acute, or sometimes minutely bifid. Beneath, the rostrum is armed with four teeth, and densely ciliated. Antennæ of both pairs as in *P. vulgaris.* Feet of the second pair long, reaching much beyond the extremity of the rostrum; extremity of carpus just falling short of the end of the antennal scale; hand much stouter than in *P. vulgaris;* fingers a little shorter than the palm. The feet of the first pair reach scarcely beyond the extremity of the carpus of the second pair.

Of the same size, and nearly allied to *P. vulgaris*, but easily distinguished by its recurved rostrum, and larger feet of the second pair. It has been distributed to other museums under the name *Palaemonopsis carolinus.*

It was originally found in the harbor of Charleston, S. C., by Col. J. D. Kurtz and myself, and has since been found in

Great Egg Harbor, N. J., by Professor Baird. I have also dredged it in the harbor of Beaufort, N. C., and off the neighboring coast at the depth of from two to seven fathoms.

Palaemonetes exilipes, nov. sp.

Rostrum long and slender, longer than the antennal scales, and with its dorsal crest rising rather abruptly (more so in some specimens than in others) a short distance behind the eyes, and serrated with six (rarely seven or eight) small, acute, equidistant teeth, separated rather widely from each other at base; the second tooth is placed just over the base of the eye-peduncles. The point of the rostrum is very slender and acute, never bifid; and the inferior crest is armed with two or three teeth. Antennulæ variable in length, but usually half or two-thirds as long as the body, with the outer flagellum longest, and having the thick part much shorter than the slender part, and united to it for nearly the whole of its length. Feet very slender and naked; in the second pair the carpus is a little thickened toward the extremity, and reaches to the end of the antennal scale; and the hand is small, about half as long as the carpus, and but little thicker than its extremity. Fifth pair of feet longer than the third and fourth, and reaching a little beyond the extremity of the antennal scale.

Length about an inch and a half.

This species has been distributed under the name *Palaemonopsis exilipes.*

Found in fresh water at Somerville, S. C., by Dr. Charles Girard.

Leander pandaliformis, nov. sp.

Rostrum slender and much longer than the carapax and than the antennal scales, curving upward, and very slender at the extremity. Its dorsal crest commences at the anterior third of the length of the carapax, and its posterior two-thirds is armed with seven teeth, the second tooth being over the base of the eye-peduncles; its anterior third is unarmed, except by a minute tooth close to the extremity. Below, the margin of the rostrum is densely fringed with short hairs, and armed with eight small and somewhat distant teeth. The antennæ and antennulæ are of equal length, and about two-thirds as long as the body. The inner flagellum of the antennulæ is one-half as long as the outer one, of which the thick part is short and united to the thin part for but a short distance at the base. The antennal scale is broad, and the lobe of the inner extremity projects strongly forward. The outer maxillipeds are very slender, and reach a little beyond the extremity of the peduncle of the antennæ. Feet very slender; almost entirely naked, and unarmed; in those of the second pair the carpus reaches to the extremity of the rostrum; hand very small, and less than half as long as the carpus. Posterior feet so slender as to be almost hair-like; those of the last pair reach to the extremity of the rostrum. Candal segment slender; outer caudal lamella much longer than the inner one.

The color in my (alcoholic) specimens is faded, but the antennal scales, the lower margins of the abdominal segments, and the caudal lamellæ are still seen to be margined with blueish-white, and the colors were probably much more brilliant than is usual in the group.

The length is about an inch and a half.

This species is distinguished by the great length of its recurved rostrum, and of its antennæ and feet.

It was found by Prof. Theodore Gill in fresh-water streams near the sea, either in Barbados or Trinidad;—he is uncertain which.

Sicyonia laevigata, nov. sp.

The body is small and rather slender, and moderately compressed. The dorsal crest of the carapax is tridentate; teeth small, acute, equidistant; the posterior one situated nearly at the posterior third of the length of the carapax. Lateral spine of carapax very slender. Rostrum slender, pointing forward and upward at an angle of about 20° with the axis of the body; it is twice as long as the eyes, and reaches nearly to the extremity of the penult joint of the peduncle of the antennulæ; it is armed above with one minute tooth over the eyes, and one near the extremity; its extremity is truncate and armed with two or three spiniform teeth; its lower margin is almost entire.

Flagella of the antennæ only slightly depressed, and very little hairy. Feet compressed; those of the third pair reaching the extremity of the scale of the antennæ. The abdomen is sharply carinated above, but its sides are glabrous, and much smoother than in any other known species of the genus, the sulci being very narrow and the protuberant parts flattened and not rugose.

Length, 0.8 inch.

Of this species I have seen only one specimen, a male, which was taken in the harbor of Charleston, S. C., by Col. J. D. Kurtz, U. S. A.

Sicyonia brevirostris.

Sicyonia cristata **De Saussure, Crust. du Mexique et des Antilles, p. 55, fig. 25. (?)**

A species of similar size and closely allied to *S. carinata* H. M.-Edwards, from Rio Janeiro; from which it differs, however, in having three teeth on the dorsal carina of the carapax, and four on the superior margin of the rostrum, which is very short, much shorter than the eyes, and unarmed beneath.

The crustaceous envelope of this species is very much indurated. There are small round tubercles scattered on the prominent parts of the abdomen, and a few on the posterior parts of the sides of the abdomen. The length of the animal is nearly three inches.

There is little doubt that this is the adult of *S. cristata* Sauss., although the rostrum is shorter and more pointed, and the lateral furrows of the carapax much shallower posteriorly than in the specimens described by De Saussure. The name *S. cristata* is preoccupied for a Japanese species.

Found on the S. Florida Coast.

Penaeus brasiliensis.

Penaeus brasiliensis **Latreille, Nouv. Dict. d'Hist. Nat., XXV, 154. H. Milne-Edwards, Hist. Nat. des Crust., II, 414. Gibbes, Proc. Am. Assoc. Adv. Sci., 1850, p. 198.**

Professor Milne-Edwards states that this species differs from

P. caramote in having three teeth on the inferior edge of the rostrum. The number is, however, generally two, as in *P. setiferus.* The chief difference is that pointed out by Gibbes;—the want of spines at the base of the third pair of feet.

This species is often found in brackish water, and even ascends streams to points where the water is nearly or quite fresh. It was thus found in the Croton River at Sing Sing by Prof. Baird, and by myself in a fresh-water creek near Somers' Point, N. J. Besides these localities there are specimens in the Smithsonian collection from Great Egg Harbor, N. J. (Baird), Charleston, S. C. (Gibbes), Tortugas, Fla. (Whitehurst), Pensacola, Fla. (Jeffrey), New Orleans (Couch), Brazos Santiago, Tex. (Van Vliet), and Brazil (A. H. Riise).

Penaeus setiferus.

Cancer setiferus Lin., Syst. Nat.

Penaeus fluviatilis Say, Jour. Acad. Nat. Sci., Philad., I. 236.

Penaeus setiferus H. Milne-Edwards, Hist. Nat. des Crust., II, 414. Gibbes, Proc. Am. Assoc. Adv. Sci., 1850, p. 199.

The flagella of the antennulæ in males differ from those of females in being less tapering, naked, and armed with corneous teeth like those of a file, which form spinules along the margin.

In a specimen from Mobile Point, the rostrum is armed with one tooth only on the inferior edge.

Our specimens are from the following localities:—Norfolk, Va. (Farragut); Charleston, S. C. (Gibbes); Florida (Agassiz); Mobile Point, Ala. (Wurdemann); Biloxi, Miss. (Bellman); Calcasieu Pass, La., and Galveston (Kennerly); St. Joseph's I., Texas (Wurdemann); Brazos Santiago (Van Vliet).

Penaeus pubescens, nov. sp.

Surface of thorax and abdomen short-pubescent. Lateral furrows of carapax shallow and inconspicuous, being filled with pubescence; lateral spine acute. No trace of a longitudinal furrow on the dorsum. A sharp and rather long spine on the anterior margin at the insertion of the antennulæ, and one at the antero-inferior corner of the carapax. Rostral crest extending only as far back as the first or posterior tooth, which is situated at about the anterior third of the length of the carapax, and far distant from the second tooth, which is placed over the base of the eye-peduncle. Beyond and including this second tooth there are seven teeth on the superior margin of the rostrum, and perhaps more, as the tip is broken in our specimen. There are no teeth on the inferior margin. The rostrum, in its broken condition, reaches to about the middle of the penult joint of the peduncle of the antennulæ. Eyes very large. Antennulæ short, as in *P. setiferus;* the lamelliform appendage at its base is small, long-ciliated, and pointed, not dilated, at its extremity; flagellum very short. Antennæ only as long as the body; the antennal scales are a little shorter than the peduncle of the antennulæ. Feet unarmed at base; hands of the third pair very slender. Abdomen carinated from the middle of the second joint backward to the sixth joint, the carina becoming sharper and prominent towards its posterior extremity; seventh or caudal joint sublanceolate, very slightly furrowed above, without carinæ, and terminating in an acute spine, with a smaller spine on either side at its base. Caudal lamellæ pubescent; the inner one longitudinally bicarinated in the middle, not sulcated as in *P. brasiliensis* and *P. setiferus.*

Of this species I have seen but one specimen, a female, two inches in length, excluding the antennæ.

It was presented to the Institution by A. H. Riise, Esq., who collected it at St. Thomas.

Penaeus stylirostris, nov. sp.

Somewhat allied to *P. setiferus,* but with the following well-marked distinctive characters. The carapax behind the rostrum is obtusely carinated nearly to the posterior extremity; the carina being sometimes furrowed along the middle for a short distance at the point where the cervical sulcus would cross if continued, at which point there are two small pits indicating the attachment of the posterior supports of the stomach. Rostrum long, over-reaching the antennal scales, four-toothed below, and, including carina of the carapax, eight-toothed above, the posterior tooth above being placed a little before the middle of the carapax. Terminal half of the rostrum styliform, without teeth above. Lateral furrows of the rostrum distinct, extending to the posterior tooth. Antero-lateral spine and sulci nearly as in *P. setiferus.* Antennulæ with the inner flagella much longer than the outer ones, and about as long as the carapax. Spines on the bases of the first and second pairs of feet very small. In the female the feet of the last three pairs bear lamelliform processes on the inner sides of the coxæ, and the sternum between the bases of the posterior feet bears a short but much projecting dentiform median carina. The abdomen is similar to that of *P. setiferus.*

Length of the largest specimen in the collection, six inches, excluding antennæ. Length of flagellum of antennæ, about twelve inches.

It differs from *P. semisulcatus* in its longer rostrum and antennulæ, and from *P. carinatus* in the oblique position of the anterior cervical sulcus.

Found at Panama by J. H. Sternbergh, Esq.

Penaeus constrictus, nov. sp.

The abdomen is naked and glossy, but the carapax, particularly toward the front part, is pubescent with extremely minute setæ, directed forward, so that the surface is easily rubbed in a forward direction, but resists strongly when rubbed backward. The hepatic spine, and antennal spine, ridge, and sulcus are well marked or even prominent. The cervical sulcus is well-marked, and may even be traced in the middle of the back on either side of the median carina; it is deflected near its anterior extremity, running to the inferior margin of the carapax, and forming a deep groove parallel with the anterior margin; giving the carapax, seen from below, the appearance of being constricted close to its anterior extremity. A furrow along the inferior side of the antennal ridge flows into the cervical sulcus at the point where the latter is deflected. The angle at the outer base of the eye-peduncle projects a little, but scarcely forms a spine. The carapax is carinated on the anterior three-fourths of its length,

the carina being slightly flattened and longitudinally grooved at the point where the cervical sulcus crosses, and bearing a small tooth or spine behind the base of the rostrum. The rostrum is straight, ensiform, reaching the middle of the penult joint of the peduncle of the antennæ, and pointing forward and upward at an angle of about 20° with the horizon. It has a strong lateral carina, with a groove on each side of it, the upper groove being continued backward as far as the little gastric tooth of the carina of the carapax. Its dorsal crest is armed with eight teeth, which are equidistant, and diminish regularly in size toward the extremity, the anterior tooth being very near to this extremity, which is slender and acute. The inferior margin of the rostrum is ciliated and entire, without teeth. Eyes large, reniform. Antennulæ stout; peduncle longer than the flagellum, overreaching the acicle or scale of the external antennæ, and very pubescent above; its penult joint three or four times as long as the terminal joint. Feet of the first two pairs armed with a spine on the basis joint. Last pair of feet longer than the fourth pair, and nearly reaching the extremity of the acicle; dactylus half as long as the penult joint. Abdomen carinated from the fourth to the sixth joint inclusive; carina cristiform. Median sulcus of last joint very deep and narrow, defined by two carinæ: this sulcus is abruptly terminated at the base of the mucronate point which forms the posterior extremity of the joint. The first pair of abdominal appendages in the male have the inner lamellæ soldered together and folded, but diverging at the tip, forming two hard, lunate processes like the flakes of a grapple; the distance between the tips of these processes equalling two-thirds of the length of their peduncle.

Dimensions of a male specimen: Length, excluding antennæ, 1.70; length of carapax, rostrum included, 0.60; length of rostrum, 0.22; length of penult joint of the abdomen, 0.20 inch.

This species was dredged by me at the depth of four fathoms on a sandy bottom in the harbor of Beaufort, N. C., and I have also taken it in Charleston Harbor.

VII.—*Descriptions of three New Species of American Birds, with a Note on Eugenes spectabilis.*

BY GEO. N. LAWRENCE.

Read November 27th, 1871.

1. Mimus nigriloris.

PLUMAGE above dusky cinereous, each feather with the centre blackish-brown; a superciliary stripe of creamy-white extends from the front as far as the occiput; lores deep black, and behind the eye a broad stripe of brownish-black; sides of the head and the throat dull white with a slight fulvous tinge, the latter bordered on each side by a narrow stripe of black; across the side of the neck is a broad mark of pale fulvous; tail feathers blackish-brown, having a hoary appearance above for the greater part of their length from the base, the outer three on each side are light dusky fulvous at their ends for rather more than an inch in extent; quills blackish-brown edged with dull ochreous, wing coverts dark brown with whitish-gray margins, the primary coverts end largely in creamy-white, forming a conspicuous bar over the primaries; under wing coverts brownish-ash, edged with dull white, the inner margins of the quills are very pale fulvous white; breast brownish-ash, the feathers with grayish margins; abdomen and under tail coverts dull white just tinged with fulvous; sides the color of the breast and sparingly striped with blackish-brown; bill black, except the basal half of the under mandible, where it is yellowish-white; tarsi light hazel-brown in front, whitish behind.

Length 10½ in.; wing 4⅞; tail 5½; tarsi 1½; bill ⅞.

Habitat. Mexico.

Remarks. I obtained the above-described bird from Dr. C. H. Van Patten, of Costa Rica, who got it in exchange from Mr. Gruber, of San Francisco, by whom it was labelled as coming from Mexico. As it looked so unlike all other North American species of *Mimus*, I thought the locality given might possibly be erroneous, and that, perhaps, it was one of the stout, darkly-colored South American forms of that genus, but on investigation, failing to make it agree with any of them, I consider it undescribed, and for the present, Mexico must be received as its habitat.

. It is related to the South American group represented by *M. thenca*, *M. longicaudatus*, etc.; in coloring it somewhat resembles the last-named species, but is darker, with a much stronger bill; the toes and claws are longer and much stouter, those of *longicaudatus* being comparatively quite feeble; the ashy coloring on the breast is much darker, and the abdomen clearer in color, the under tail coverts are colored like the abdomen, whereas those of *longicaudatus* are of a light reddish-brown; the black lores and the basal half of the under mandible being yellowish-white, are distinguishing characters.

The upper plumage in the new species is of a smoky brown, that of *longicaudatus* is lighter and more of an ochreous color, in *thenca* the back is ashy, and the rump with a rufescent tinge, the latter species is much lighter below than the others, the breast having an ashy suffusion, and the under tail coverts being pale fulvous.

2. Buarremon sordidus.

A broad stripe of light reddish-ochreous extends over the front, crown, and hind neck, the feathers of the front have their centres dusky; sides of the head black; back and wing coverts of a dull greenish olive-brown, tinged with ochreous; the tail feathers are black and the wings brownish-black, both with margins the color of the back; the throat is dull light yellow, with a narrow line of dusky feathers extending down from the lower mandible on each side, the feathers of the breast and of the abdomen are of a soiled yellowish-olive, with narrow dusky-brown shaft stripes, sides colored like the the back, but with rather more of an ochreous tinge; bill blackish-brown, with the cutting edges and the lower part of the under mandible pale brown; tarsi and toes light fleshy-brown.

Length about 6 in.; wing 3; tail 3; tarsi 1 $\frac{1}{16}$; bill $\frac{1}{2}$.

Habitat. Bogota.

Remarks. In the stripe over the crown and the black sides of the head, this species resembles *B. leucopterus* and *B. pallidinuchus*, but the stripe is uniform in color, and is paler and duller than it is in *B. leucopterus.* The stripe in *B. pallidinuchus* is of two colors, being whitish on the hind neck; in all other respects they are entirely unlike. The coloring, generally, is dark and dull, and it appears to differ from all others of the genus, in the striped character of the under plumage.

3. Serpophaga grisea.

Front, crown, and lores sooty black, sides of the head and the hind neck grayish-fuliginous; upper plumage of a clear grayish-cinereous; tail feathers black, tipped with whitish-gray; quills and wing coverts black, the latter with very narrow edgings of dull gray; under plumage and under wing coverts light ashy-gray, the throat and abdomen whitish; bill and feet black.

Another specimen—perhaps younger—has the head rather lighter in color, and the wing coverts end in pale ochreous-white.

Length 4 in.; wing 2; tail 1 $\frac{1}{16}$; bill $\frac{5}{16}$; tarsi $\frac{5}{8}$.

Habitat. Costa Rica.

Remarks. These two specimens were in a large collection of birds, made mostly in the vicinity of San José, by the Messrs. Carmiol, for Dr. C. H. Van Patten, from whom I obtained them.

It differs from specimens of *S. cinerea* from Ecuador and New Granada in being smaller in all its measurements, and in having the under plumage whiter, especially on the throat and abdomen. In *S. cinerea* the throat and breast are much darker and uniform in color; but the most marked differences are in the absence of concealed white on the crown feathers, and in wanting the conspicuous white terminations of the wing coverts, which exist in the other species, the edges of the wing coverts in *S. grisea* are scarcely perceptible.

This is possibly the same as the species referred to *S. cinerea* by Mr. Salvin (*Ibis*, 1869, p. 319), for which it might easily be mistaken at first sight, or by a too hasty determination, but from which, in my opinion, it is quite distinct.

Note on Eugenes spectabilis.

Mr. Salvin (*Ibis*, 1869, p. 316) expresses doubt as to the distinctness of this species from *E. fulgens.* Having lately procured, from Dr. C. H. Van Patten, several adult males of *E. spectabilis*, collected near San José, Costa Rica, I have been enabled to make more satisfactory comparisons with *E. fulgens*, the type of *E. spectabilis* being a female. The differences between them, pointed out below, seem to me to clearly establish the validity of my species.

The dimensions are somewhat larger than those of specimens of *E. fulgens* from Mexico and Guatemala; in the color of the crown they are much alike, but it appears to be of a rather deeper violet in *E. spectabilis*, in which species the green on the front is much greater in extent; the entire hind neck and the back as far as the middle are sooty black, whereas *E. fulgens* has a narrow band of black next the bright color of the crown, and only a wash of fuliginous on the hind neck and upper back, not so decided or extensive as in the other; the color of the lower part of the back and upper tail coverts is grass green, not golden as in the northern species; the tail above is bronzy brown, and underneath is washed with fuliginous, much darker than in *E. fulgens;* the color of the throat in *E. spectabilis* is much deeper, being bluish-green, instead of silvery-green; the entire under surface below the gorget is clear green, whereas in *E. fulgens* there is a wash of smoky black from the gorget extending over the breast; the under tail coverts are darker in *E. spectabilis.*

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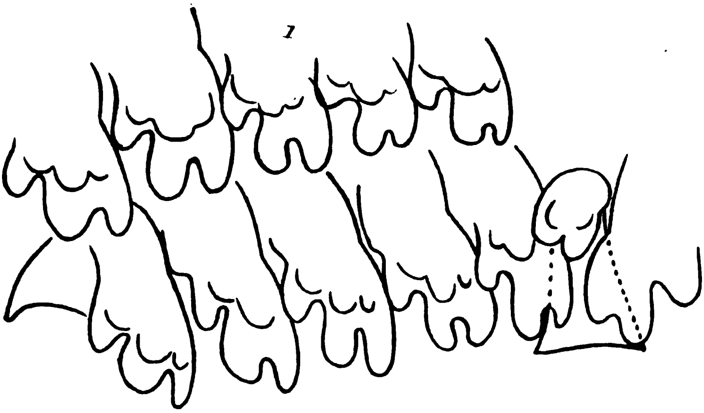

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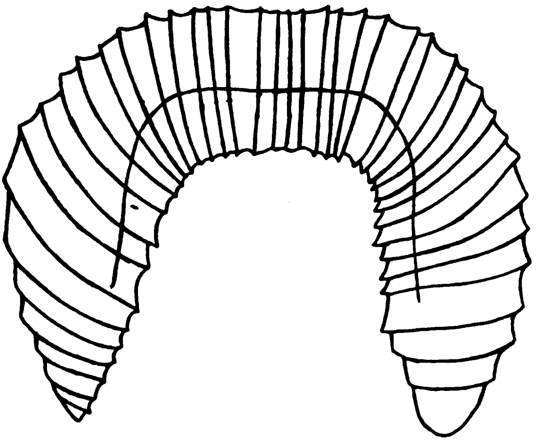

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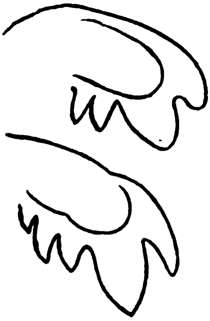

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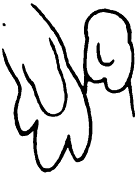

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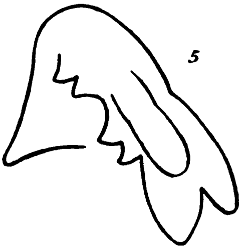

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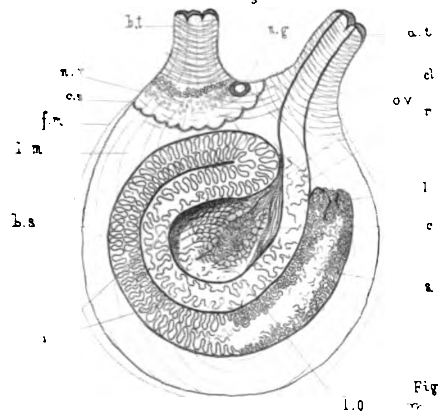

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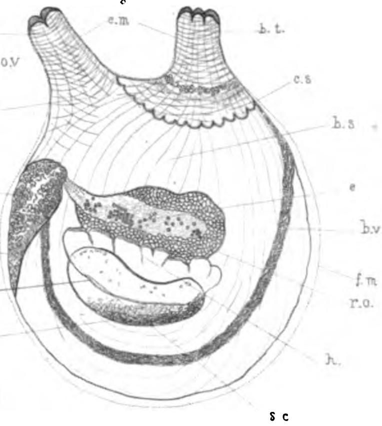

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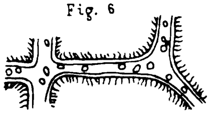

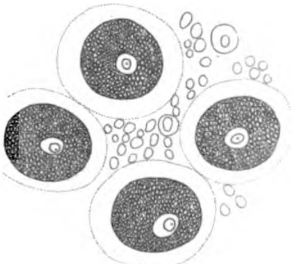

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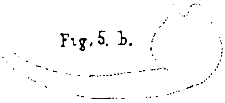

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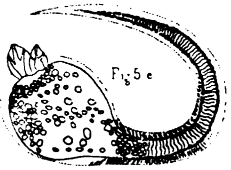

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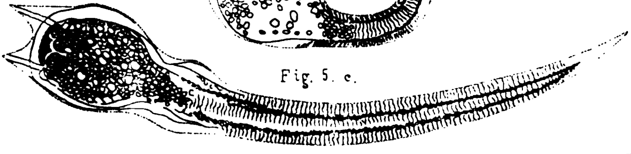

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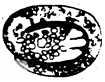
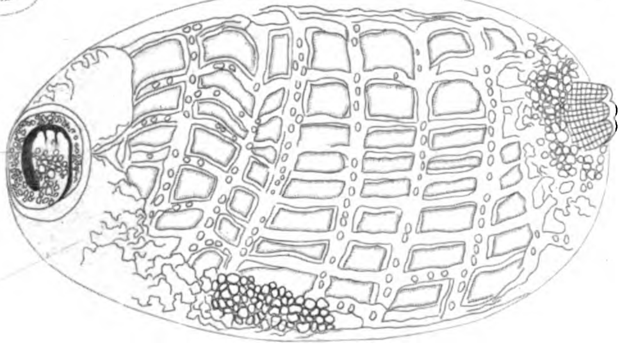


Fig. 4



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CONTENTS.

VIII.—On the Tarsus and Carpus of Birds. By EDWARD Sylvester MORSE, Ph. D. (With Plates IV and V) . . . 141.

IX.—On the Systematic Arrangement of North American Terrestrial Mollusks. By THOMAS BLAND and W. G. BINNEY. . . . . 158.

X.—Monographie des Poissons de Cuba compris dans la sous-famille des Sparini. By FELIPE POEY. (With Plates VI and VII.) . . . . 170.

XI.—Description of New Species of Birds of the Genera Icterus and Synallaxis. By GEO. N. LAWRENCE. . 184.

XII.—Description of a New Species of Mollusc of the Genus Helicina. By THOS. BLAND. . . . . . 186.

XIII.—Notes on Specimens of Corbiculadæ in the Cabinet of the Jardin des Plantes at Paris, and on the authorship of the Encyclopédie Méthodique. By TEMPLE PRIME. . 188.

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VIII.—*On the Tarsus and Carpus of Birds.* (*Plates* IV, V.)

[illegible]

BY EDWARD S. MORSE, PH. D.

Read January 29th, 1872.

AMONG the many interesting features of structure, common to birds and reptiles, that have been pointed out from time to time by Huxley, Gegenbaur, Dana and others, that point which established the existence of tarsal bones in birds, with the joint occurring between the first and second tarsal series as in reptiles, seems the most important.

There is still, however, a variance of opinion as to the number and condition of the tarsal and carpal bones in birds, and upon this question I hope to throw some little light.

The most important contribution has been made by Gegenbaur,* who has shown the presence of two tarsal bones in the embryo chick, which unite, respectively, with the distal end of the tibia and the proximal end of the metatarsus, leaving the ankle joint between the proximal and distal tarsal series, as in reptiles. In the upper tarsal bone he figures two centres of ossification, and from what he finds in certain reptiles, believes that these two centres in the cartilaginous mass indicate the presence of two tarsal elements, the astragalus and calcaneum.

In referring to other authors, I find a great difference of opinion respecting the existence of any tarsal bones. Prof. Owen, who has contributed so largely to our knowledge of the osteology of birds, particularly the larger and more aberrant forms, such as *Apteryx*, *Dinornis*, *Æpyornis* and

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* Untersuchungen zur Vergleichenden Anatomie der Wirbelthiere. Erstes Heft Carpus und Tarsus. Leipzig, 1864.

others, while admitting the existence of three carpal bones, one of which, the *magnum*, unites with the base of the mid-metacarpal, says, in his last work on the Comparative Anatomy of the Vertebrates,* that the tarsus is absent, or perhaps blended with the tibia or metatarsus. In speaking of the term *tarso-metatarse*, as applied by some ornithotomists to the segment sustaining the phalanges, he says it implies the tarsal homology of the epiphysis, and adds that the same might be predicable of the distal epiphysis of the tibia; but neither of these points being demonstrated, he prefers to call that segment the *metatarse*.

Still later, in the year 1869, in a memoir on the Fossil Reptiles of the Liassic Formation,† he strongly insists upon calling the tarsal bones of birds, epiphyses.

Admitting, as Prof. Owen does, the excessive tendency in the skeleton of birds to anchyloses, and further admitting the interesting correspondence between the wing and the leg, in the coalescence of the metacarpals and metatarsals respectively, and also admitting the confluence of the *magnum* with the proximal end of the mid-metacarpal, it seems strange, indeed, that he could not have interpreted the so-called epiphyses of the tibia and metatarsals as true tarsal ossicles; or, having interpreted them as epiphyses, that the same mode of reasoning should not have led him to regard the *magnum* as an epiphysis also.

Mr. W. K. Parker, in a valuable paper on the osteology of *Balæniceps rex*,‡ suggests the existence of a tarsal bone, in describing the tibia of that bird, as follows: "This inferior, or distal end of the tibia is developed from a distinct osseous centre in young birds, which piece forms all the articular parts, and sends upward a wedge-shaped process in front—the seat of the ossification which makes the large, wide, oblique, tendon-like bridge.

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*Vol. II, p. 79. † Palæontographical Soc., Vol. XXIII, part II, p. 77.
‡ Zoological Trans., Vol. IV, part 7, 1861.

"Below this bridge the bone is deeply scooped, and the concavity between the condyloid margins of the trochlea is very considerable. Query. Is the lower articular portion of the tibia an epiphysis of the tibia itself, or is it the homologue of the mammalian astragalus?"

Gegenbaur's discoveries confirm the supposition of Mr. Parker, and prove that the term *tarso-metatarsus* is appropriately applied to that segment of the leg bearing the phalanges.

Besides the discovery of Gegenbaur's, above mentioned, of the two tarsal bones and the two centres of ossification in the upper, or proximal one, he recognizes and figures two carpal bones, one corresponding to the radius, the other corresponding to the ulna; these he designates, respectively, the *radiale* and the *ulnare*.

In considering these points, and reflecting upon the character of these bones in the higher classes of vertebrates, it seemed to me that further investigation should reveal more carpal bones in birds; that bones representing the distal carpal series should be present, and that the calcaneum and astragalus should be more clearly demonstrated.

In the land tortoises, the chelonians, monitors, crocodiles and even in the low batrachians, whatever the number of ossicles the carpus and tarsus respectively present, there appear to be at least two ossicles in the first, or proximal series, as in the *pes*, for instance, where there is one corresponding to the tibia, and another corresponding to the fibula.

In the carpus, likewise, according to the demonstrated homology between the fore and hind limbs, we should expect to find other carpal bones anchylosing with the proximal ends of the metacarpals, leaving the joint between the first and second carpal series, as in the tarsus. With no prejudice in favor of these views, nor doubting the observations of others, I yet determined to satisfy myself, and so took up the study of these features, as revealed in the embryonic stages of the class.

Knowing the importance of making many observations upon different species, in order to arrive at any general truth in the matter, I studied the embryos of all the birds at my limited command, and my only regret is, that the species I was able to examine were so few in number, and so similar in character. For this material my thanks are chiefly due to Mr. Frank L. Scribner and Anson Allen, Esq.

The embryos studied were those of the Bank swallow, *Cotyle riparia;* Eave swallow, *Hirundo lunifrons;* Kingbird, *Tyrannus Carolinensis;* Crow blackbird, *Quiscalus versicolor;* Cow blackbird, *Molothrus pecoris;* Bluebird, *Sialia sialis;* Chipping sparrow, *Spizella socialis;* Yellow warbler, *Dendrœca æstiva;* Wilson's thrush, *Turdus fuscescens*, and the Spotted sandpiper, *Tringoides macularius.*

I have no means of determining, with certainty, the age of any of the embryos examined, but have made a careful life-size drawing of each one, so that an approximate idea may be formed of their condition and age.

As all these studies were made from living specimens, more dependence can be placed upon the results obtained, than if they had been drawn from alcoholic specimens, in which the tissues are opaque.

TARSUS. (See plate IV.) In all the embryos examined, there were three distinct bones composing the tarsus. Two of these belonged to the proximal series, one corresponding to the tibia, and the other to the fibula, representing, respectively, the astragalus' and calcaneum. (It seems better to use the terms given by Gegenbaur to these bones, as it removes all objection on the score of questionable homologies. The terms *tibiale* and *fibulare* will therefore be applied to these two bones, and *centrale* to the remaining one belonging to the distal series.) The *tibiale* is generally the largest, and in birds, the inner condyle at the distal end of the tibia is usually the largest, which is in accordance with the proportions of the tarsal bone representing this process. The *fibulare* unites with the *tibiale* at a very early age, there being a sort of hour-glass shaped constriction between them. From their resemblance, at this stage, to a similar bone in *Lœlaps*, as determined by Prof. Cope, the correctness of the term *astragalo-calcaneum*, applied to that bone by him, is confirmed.

The coalescence of these two bones, forms the peculiar bi-condylar trochlea of the distal end of a bird's tibia; a firm joint is thus rendered; for the inner condyloid margins, thus produced, bear against either side of the *centrale*, which early unites with the proximal ends of the metatarsals.

The mid-metatarsal is generally the shortest at the proximal end, and the *centrale* fills up the depression thus made.

In the crow blackbird the proximal end of the mid-metatarsal at an early stage is crowded back by the metatarsals upon each side of it, as is usual in adult birds.* In the same bird the *centrale* is small and round, and unites chiefly with the mid-metatarsal. In the spotted sandpiper, the *centrale* is lozenge-shaped, and caps the three metatarsals. The *tibiale* and *fibulare* unite, forming a symmetrical hour-glass shaped bone.

In the bank swallow and kingbird, the *centrale* is similar in shape to that of the sandpiper, and in like manner caps the metatarsals. In the bluebird, the *centrale* is very large and irregular in shape, and unites first with the second metatarsal, but overlaps the others. In the yellow warbler the *centrale* is very large and irregular in shape, presenting two conspicuous prominences upon its articular face. In the eave swallow, the *centrale* unites with the metatarsus a long time before the *tibiale* and *fibulare* have united with each other, or with the tibia.

In all the birds examined, the *tibiale* and *fibulare*, with one exception, anchylose together before they unite with the

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*See Owen, immature *Dinornis crassus*, Trans. Zool. Soc., VI, pl. 6, and Dr. R. O. Cunningham's *Rhea Darwinii*, Proc. Zool. Soc., 1871, pl. 6. figs. 7 and 8.

tibia. This exception occurs in the kingbird, where these two bones appear to unite with the tibia first, leaving a deep intercondylar groove between them.

CARPUS. (See plate v.) In the fore limb or wing there are at least four carpal bones, two in the proximal series, and two in the distal series. When more than four carpals occur, as in the yellow warbler, and possibly in the kingbird, the extra one is found on the radial side, and this seems to be in accordance with what obtains in the higher vertebrates, where we find on the radial side three carpals; the *scaphoid*, *trapezoid* and *trapezium*.

In the proximal series of carpal bones, the *scaphoid* or *radiale* is the largest, and is the first bone to appear in the development of the carpus. This bone is always free.

The cuneiform or *ulnare* is smaller, and in most of the species examined is found beyond the outer edge of the ulna.

In Wilson's thrush, the bank swallow and yellow warbler, it seems to anchylose with the outer distal end of the ulna, so closely is it appressed to that region. On consulting Dr. Elliott Coues in regard to the subject, he informed me that two free carpals are always present in the adult yellow warbler. As this bird when embryonic has an extra carpal present on the radial side, it may be this one with the *radiale* that makes up the two free carpals, yet observations are very limited in this respect; and until the contrary is proved, I shall hold that the *ulnare* may unite with the ulna.

In the distal carpal series is a bone which appears next in development. Whether this represents the *intermedium* and *centrale*, connate, or the third *carpale* (*magnum*), I am not able to say. It is always found at the base of the mid-metacarpal, to which it early anchyloses. This bone is quite small, and lenticular in shape in Wilson's thrush, the chipping sparrow, crow blackbird, eave swallow, bank swallow, kingbird and yellow warbler, and large in the cow blackbird and bluebird.

In the kingbird an accessary carpal is seen near the third *carpale*, from which it seems to have separated, fig. 47, plate V. As I found it in no other specimen, it may have been the result of accidental pressure in examination.

The other bone in the distal series may be regarded as the unciform, or *fourth carpale* of Gegenbaur's nomenclature.

This is the last carpal bone to appear in development, though it often attains as large a size as the *third carpale*. This anchyloses almost simultaneously with the base of the *annularis* metacarpal, the *third carpale* and the approximate surface of the mid-metacarpal. The *third* and *fourth carpale* are seen united, by a cartilaginous band, at an early stage in the chipping sparrow and Wilson's thrush. In the cow blackbird the two distal carpals unite before they have joined their respective metacarpals.

In one specimen of kingbird examined, there appeared to be a second carpal just beyond the *radiale*, and similar to that in form; as it was not seen in another specimen, it is safe to reject its occurrence at present.

A very curious shape is assumed by the *ulnare* in the kingbird, bluebird, and cow blackbird, as will be seen by referring to the plate.

With the accompanying figures, which I have endeavored to render faithfully on stone, from my original drawings, further description of these bones is unnecessary. Many other points of interest have come up in this investigation, regarding other peculiarities of the leg and wing, but a discussion of such features would be outside the intended limits of this paper.

The general results of this paper have been submitted to Prof. Jeffries Wyman and Dr. Elliott Coues, U. S. A., and my thanks are due to these gentlemen for their careful consideration of the results therein presented. With Dr. Coues, I had the pleasure of dissecting the tarsus and carpus of an adult penguin, *Aptenodytes Pennantii*, and of examining the same parts of other birds.

Prof. Wyman has generously placed at my disposal the tarsus of an embryo heron, with other specimens of the same bird, and authorized me to embody their peculiar features in this paper. Accompanying the specimens, the following letter was received, which I have the liberty of publishing:

Dear Prof. Morse,—

In a recent examination of the bones of the leg of some unfledged herons (supposed to be *Ardea cœrulea*) with reference to their ossification, to which I was led by your admirable embryological studies of the limbs of birds, I found a bone accompanying the groove on the front of the lower end of the tibia, which does not agree with any description of these parts I have seen. It is a style-shaped bone, ends in a sharp point above, has the lower end, which is on a level with the lower end of the tibia, blunt and rounded, and almost exactly resembles, in the older specimens, the fibula of the same leg inverted.

It is about one-fifth as long as the tibia, and as appears from several specimens of different ages, grows, for a time at least, in proportion to the other parts.

In the older specimens two nodules of bone are seen, side by side, in the cartilage part below the tibia, one corresponding to each condyle, as you have pointed out in other birds. These belong to the near portion of the tarsus, and may therefore be supposed to represent the astragalus and calcaneum. Thus we have these two bones entirely apart from the pretibial bone described above.

As regards the homology of this last named piece, the most natural supposition is that it is the ascending process of the astragalus to which attention has of late been called by Huxley and Cope, in discussing the affinities of birds and Dinosaurian reptiles.

Its mode of development, however, leads to the belief that it is not, properly speaking, a process of either of the tarsal bones, but a distinct bone, for it not only has an independent ossification, but is already far advanced in this process, before the ossification of either of the tarsal bones is begun. It has occurred to me that the part in question might have been originally the lower portion of the fibula, from which it had become detached by absorption, but it has not at any time been observed to be continuous with this bone, and further, it continues to grow from below upward, as the young bird gets older, instead of becoming shorter and shorter, as it ought, if this supposition was true.

Observations are now wanted to show whether the ascending process of the astragalus, as seen in the ostrich and other birds, is really an outgrowth from, and therefore a process of, one of the tarsal bones, or whether it ossifies independently, and subsequently becomes united with it. Should this last supposition be decided in the affirmative, then we

should have either a third bone in the leg, which would be contrary to all analogy, or a third member of the near tarsal series, which would, so to speak, be out of place.

Truly yours,

J. WYMAN.

Cambridge, Dec. 20, 1871.

I have examined with the greatest interest, this new tarsal bone of the heron, and from the specimens kindly loaned me by Prof. Wyman, have made the following drawings. The figures represent different stages of the tibia, from the front, with the pretibial bone at the base.

Figure 1 is magnified, the natural size of the tibia being represented by a line at its side. Figures 2, 3 and 4 are natural size.

In referring to Huxley's figures of the tibia of the young ostrich,* and of the young fowl,† I find the so-called process of the astragalus, on the outer side of the tibia, occupying the same region as that of the pretibial bone of the heron, and this leads me to believe that this so-called process of the astragalus in the birds just mentioned, is identical with the pretibial bone of Wyman.‡

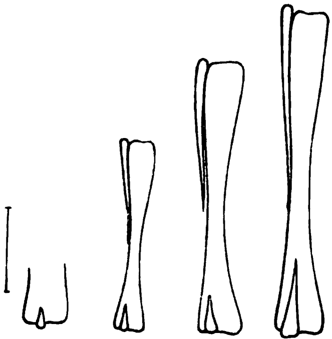

FIG. 1. FIG. 2. FIG. 3. FIG. 4.

The style shaped bone at lower end of tibia represents *intermedium*, or pretibial bone of Wyman.

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* Quarterly Jour. Geological Soc., Vol. XXVI, part I, p. 30.

† Anat. Vert. Animals, Huxley, p. 296.

‡ Since writing the above, I have received from Prof. Wyman the distal portion of a tibia from a still older specimen of the blue heron. Accompanying the specimen he writes, "This bird had not left the nest, notwithstanding its large size. You will see the pretibial piece coössified with the astragalus and calcaneum, though neither of them is consolidated with the tibia. There is nothing *now* in this specimen to show that the ascending portion was ever free from the astragalus."

We herewith give a figure of it in section, natural size (Fig. 5); see next page. This removes all doubt as to the relation of the pretibial bone, with the so-called process of the young fowl and young ostrich alluded to above, and leads to the belief that the tendon-like bridge, spanning the groove in front, originates from this piece, as stated by Parker. He also speaks of this process in *Balæniceps rex* as forming "the seat of the ossification which makes the large wide oblique tendon-like bridge. Prof. Wyman informs me that the two are not identical."

It surely is not the distal end of the fibula, for in the larger specimen of tibia examined (fig. 4) I find, with the aid of a hand lens, a delicate tendinous thread running from the lower end of the fibula and the upper end of the pretibial bone, and passing each other, showing no sign of approximation. Furthermore, in all the embryo birds I have thus far examined (see plate IV), the fibula shows no signs of torsion. Dismissing the idea that it represents a third bone of the leg, "as contrary to all analogy," we have only to admit that it represents a new tarsal bone of the proximal series.

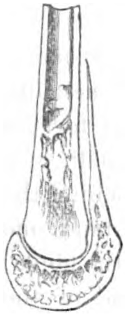

FIG. 5.

The specimen represented in figure 1, was sent to me by Prof. Wyman sometime before he had examined the other bones with reference to this new tarsal. In this specimen the metatarsals are still separate, and the presence of the three tarsal bones thus far described is but dimly made out; yet the pretibial bone is quite distinct, and of much importance is the fact that its lower edge is below the lower edge of the tibia. Satisfied that it is a true tarsal bone, to what bone in the tarsus shall we compare it?

After studying over it very carefully, and comparing it with figures of certain amphibians, given by Gegenbaur, and with some of my own drawings of the tarsus of the common wood salamander, *Plethodon erythronotus*, I believe it to represent the *intermedium* of Gegenbaur. In the tarsus of *Salamandra maculosa*, as given by Gegenbaur, the *intermedium* is represented as a much elongated bone, broader at the bottom, and wedged between the tibia and fibula, half of it being actually above the distal margins of these two bones. Above the reptiles, the *intermedium* is supposed by Gegenbaur to coalesce with the *tibiale* or astragalus.

In other words the astragalus represents the *intermedium* and *tibiale*, connate. Gegenbaur believes that the astragalus represents the *scaphoid* and *lunare* of the carpus. In some mammalia these two latter bones are connate, *e. g.*, in the carnivora; while in others they are free.

The position of this pretibial bone appears anomalous, but when we consider the remarkable displacement of other bones in the bird's leg, the occurrence of this new tarsal in such a place, is by no means unreasonable. The displacement of certain bones in the bird's leg, is the result, as it were, of lateral compression, or rather lateral contraction. The fibula is always reduced to a mere splint bone, and is closely appressed to the tibia. The metatarsals are so crowded together that the proximal end of the mid-metatarsal is forced back, so that the flanking metatarsals actually meet in front. All these ultimately anchylose and form a single bone. The first metatarsal is reduced to a half, or a third the size of the others, and is often crowded behind the others. The two proximal tarsal bones at first, stand one at the end of the tibia, and the other at the end of the fibula, the *tibiale* being actually as wide as the distal end of the tibia (see plate IV, fig. 1); yet in a short time these two tarsal bones are gradually brought together, and as the fibula becomes reduced in comparative size, the tibia takes on an accelerated growth, so that its distal end equals in width the two tarsals to which it finally unites.

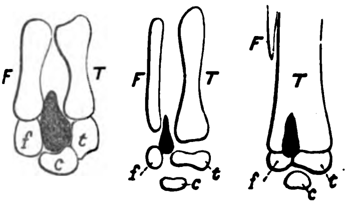

FIG. 6. FIG. 7. FIG. 8.

The *intermedium* in the three figures is represented black.

Fig. 6. Representing lower portion of leg of *Salamandra maculosa*, copied from Gegenbaur, with distal tarsals omitted.

Fig. 7. *Spizella socialis* copied from fig. 1, plate IV, of this paper, with *intermedium* introduced.

Fig. 8. Ideal figure showing true position of *intermedium* in relation to proximal tarsal bones.

F. Fibula. *T. Tibia.*
f. fibulare. *t. tibiale.*
c. centrale.

To show still more plainly the reasons for believing that the pretibial bone of Wyman represents the *intermedium*, the following diagrams are presented. The *intermedium* is represented black. Figure 6 represents the *intermedium* and its associate tarsals in relation to the tibia and fibula of *Salamandra maculosa*, after Gegenbaur.

Figure 7 represents the tarsus of an embryo bird, with the pretibial bone introduced, bearing the same relation that it afterwards does to its own tarsals; and figure 8 represents the pretibial bone and its actual relation to the two tarsals, as seen in Professor Wyman's oldest specimen, the tibia now having widened so as to include the two tarsals within its lateral boundaries, and consequently including the pretibial bone also. That the tibia widens at its distal extremity in that way, so as to equal in width not only the two tarsals, but the three metatarsals, may be seen by referring to plate IV; and indeed to suppose that it would do so is reasonable, since the excessive reduction of the fibula naturally enhances the greater proportionate development of the tibia; and by this excess of growth, the pretibial bone, or intermedium, finds its anomalous position in front of the tibia.

In connection with this elongated *intermedium*, it is interesting to note that in certain lizards where the intermedium is absent, the *centrale* takes on the elongated and slender form, and is wedged between the other tarsals.

If further investigation should prove the correctness of this interpretation, we have an interesting stage in the conditions of this bone represented, namely, that in birds the *intermedium* is at first a separate bone, as in the lower reptiles, but finally it anchyloses with the astragalus, as in higher vertebrates, thus proving the correctness of Gegenbaur's statement that the astragalus of higher vertebrates represents the *tibiale* and *intermedium* connate.

Thus we must recognize in birds the presence of four tarsal bones, and at least four carpal bones.

CONCLUDING OBSERVATIONS.—At an early stage of the embryo the leg and the wing are almost precisely alike, and even after the principal bones have made their appearance the two appendages are remarkably alike in the form and proportion of their parts. This similarity was noticed by

Agassiz a long time ago, as well as the fact that in the embryo robin, the toes are webbed. In the early embryo the toes are always webbed, and for a long time in the embryo all the toes point forward; these are two characters highly characteristic of lower groups of birds. The turning back of the first toe is a subsequent modification.

The first metatarsal appears last in development. The phalanges of the third and fourth toes appear first, and the others in regular succession. The phalanges of the foot appear before those of the hand.

The metacarpals and phalanges are widely separated in the early embryo, and were it possible for the wing at this stage to make a track in the mud, the impression would be like that made by a tridactyle foot. In fact it is a tridactyle foot at this stage. The metatarsals are also separated at the same stage, but not so widely as the metacarpals.

There is a difference of opinion among anatomists in their interpretation of the fingers of the wing. Gegenbaur, Huxley, Rolleston and others, regard the marginal finger on the radial side as representing the first finger, or pollex, while Wyman, Owen and Coues, believe this digit to represent the index, or second finger. It seems more reasonable to believe that this latter interpretation is right; for when the number of fingers or toes is reduced in Mammalia and Reptilia, they are always taken away from the sides of the member, the thumb first disappearing and then the little finger.

If we compare the leg and wing of *Spizella* (figs. 1 and 32, pl. IV and V) we shall see that in this early stage there are but three metatarsals and three metacarpals, and it seems reasonable to compare them together.

As the first toe appears much later and is reduced to two phalanges, and has its metatarsal also greatly reduced, and as at the stage just cited the first toe is represented only by a few granules, it seems natural to infer that in the wing, the first finger never makes its appearance.

In regard to the reptilian characters in birds, it seems that a nearer relation between birds and pterosaurians can be established, with the additional carpals pointed out in this paper. At least one of the characters for separating the pterosaurians from the birds, as given by Owen, fails in the light of these distal carpals.

Owen says, in his "Fossil Reptiles of the Liassic Formation,"* that:—

"A carpus with one large and one small bone in a proximal row, and with a second large, and at least one small one in a distal row, is another character by which the pterosauria manifest their closer affinity to reptiles than to birds." Now this is precisely the character of all those birds thus far examined.

EXPLANATION OF THE PLATES.

Plate IV. THE TARSUS AND EMBRYOS.

In every case the right leg and right wing are represented. For want of room on the plates I have been compelled to leave out the humerus and femur in most of the figures given.

All the embryos are represented of natural size, and by referring to them, an approximate idea may be formed of the size of the appendage drawn, as well as the age and condition of the embryo.

Reference to the embryo preceded by the initial E, follows explanation of the figure, thus: Fig. 1, *Spizella socialis.* E. 18.

Fig. 1. *Spizella socialis.* E. 18.

The three bones separate, the *fibulare* being at the end of the *fibula.* The 2d, 3d and 4th metatarsals not complete, while the 1st metatarsal appears only as a few granules.

Fig. 2. *Spizella socialis.* E. 19.

Tarsal joint appearing, in separation of cartilage between proximal and distal tarsal bones.

Fig. 3. *Turdus fuscescens.* E. 21.

The tarsals separate. The distal end of tibia widening so as to include the proximal tarsals.

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* Palæontographical Soc., Vol. XXIII, 1869.

Fig. 4. *Turdus fuscescens.* Embryo not given.

A later stage in which the proximal tarsals have already united with the tibia, and the distal tarsal has not yet united with the metatarsals.

Fig. 5. *Turdus fuscescens.*

Another view of the same.

Fig. 6. *Tyrannus Carolinensis.* E. 23.

The *tibiale* and *fibulare* united with tibia, the *centrale* still free.

Fig. 7. *Dendrœca æstiva.* E. 24.

The two proximal tarsals united. The *centrale* very large and capping the three metatarsals.

Fig. 8. *Dendrœca æstiva.*

Another view of the same, showing the tarsal bones more distinctly.

Fig. 9. *Dendrœca æstiva.*

Another view of same, showing *centrale* capping the metatarsals.

Fig. 10. *Quiscalus versicolor.* E. 25.

The *tibiale* and *fibulare* united, but not yet anchylosed to the tibia. The *centrale* still free.

Fig. 11. *Quiscalus versicolor.*

An enlarged view of the tarsus.

Fig. 12. *Sialia sialis.* E. 31.

The proximal tarsals united with the tibia. The distal tarsal united with the fourth metatarsal.

Fig. 13. *Sialia sialis.*

Another view of the same.

Fig. 14. *Cotyle riparia.* E. 27.

A considerably advanced stage in which the three tarsal bones are distinctly separate.

Fig. 15. *Hirundo lunifrons.* E. 30.

The *tibiale* and *fibulare* about uniting. The *centrale* already blended with third metatarsal.

Fig. 16. *Tringoides macularius.* E. 26.

The *tibiale* and *fibulare* united forming an hour-glass shaped bone. The *centrale* flattened and capping the metatarsals but not yet united with them.

Fig. 17. *Turdus migratorius.*

Posterior portion of early embryo, showing the leg as a simple fin, and caudal vertebræ.

Fig. 18. *Spizella socialis.*
19. " "
20. " "
21. *Turdus fuscescens.*
22. *Molothrus pecoris.*
23. *Tyrannus Carolinensis.*
24. *Dendrœca æstiva.*
25. *Quiscalus versicolor.*
26. *Tringoides macularius.*
27. *Cotyle riparia.*
28. " " Several days from the egg.
29. *Tringoides macularius.* Just ready to hatch.
30. *Hirundo lunifrons.*
31. *Sialia sialis.*

EXPLANATION OF LETTERS.

FE. *Femur.*
T. *Tibia.*
F. *Fibula.*

TARSUS.
t. *Tibiale = astragalus.*
f. *Fibulare = calcaneum = os calcis.*
c. *Centrale = navicular = scaphoideum.*

I, II, III, IV. Corresponding *metatarsals.*

Plate V. THE CARPUS.

Fig. 32. *Spizella socialis.* E. 18.

Showing three carpals and three metacarpals. No indication of phalanges.

Fig. 33. *Spizella socialis.* E. 19.

The fourth *carpale* now formed; phalanges also formed, and fingers at this stage widely spread.

Fig. 34. *Spizella socialis.* E. 20.

Third and fourth carpal bones united, and third and fourth metacarpals united at distal and proximal ends.

Fig. 35. *Spizella socialis.*

Several days from the egg, and nearly capable of flight.

Fig. 36. *Turdus fuscescens.* E. 21.

Showing four carpals.

Fig. 37. *Turdus fuscescens.*

A slightly more advanced stage, showing the third and fourth carpal bones about uniting. The fourth *carpale* sending out a process to third metacarpal. The *ulnare* apparently uniting with *ulna.*

Fig. 38. *Turdus fuscescens.*

The same *carpus* under slight pressure. The *ulnare* separate again.

Fig. 39. *Quiscalus versicolor.* E. 25.

Showing the minute third *carpale* and the elongated *ulnare.*

Fig. 40. *Molothrus pecoris.* E. 22.

The third and fourth *carpale* united.

Fig. 41. *Sialia sialis.*

Third and fourth *carpale* about uniting, and fourth *carpale* sending out peculiar process to third metacarpal.

Fig. 42. *Sialia sialis.* E. 31.

A slightly more advanced stage, in which the distal carpals and base of metacarpals are all united.

Fig. 43. *Cotyle riparia.* E. 27.

Anchylosis far advanced. *Ulnare* supposed to have united with ulna.

Fig. 44. *Dendrœca æstiva.* E. 24.

Ulnare supposed to have united with the ulna. The carpal marked *i,* supposed to be intermedium. Third and fourth *carpale* united.

Fig. 45. *Hirundo lunifrons.* E. 30.

The four carpals all separate.

Fig. 46. *Tyrannus Carolinensis.* E. 23.

Showing excessively long *radiale.*

Fig. 47. *Tyrannus Carolinensis.*

Another specimen under pressure, with a new carpal? supposed to be *centrale.*

Fig. 48. *Tyrannus Carolinensis.*

Another specimen under pressure, in which the long *ulnare* readily separates, leading to the supposition that the second *carpale* is here present.

The peculiar form of *ulnare* in *Tyrannus,* fig. 47, is seen also in *Molothrus* and *Sialia,* figs. 40, 42 and 43.

EXPLANATION OF LETTERS.

H. *Humerus.*
U. *Ulna.*
R. *Radius.*

CARPUS.
u. *Ulnare* = *cuneiform.*
r. *Radiale* = *scaphoid* = *naviculare.*
c. *Centrale* = *central.*
i. *Intermedium* = lunar.
z. Second *carpale* = *trapezoid.*
3. Third *carpale* = *magnum.*
4. Fourth *carpale* = *unciform.*

II, III, IV. Corresponding *metacarpals.*

IX.—*On the Systematic Arrangement of North American Terrestrial Mollusks.*

BY THOMAS BLAND AND W. G. BINNEY.

Read January 29, 1872.

SINCE the publication of our work on the Land Mollusks of North America,[*] we have had the opportunity of examining the animals and the lingual dentition of many additional American, as well as numerous foreign species. We have also carefully studied the various systems of classification which have been proposed both here and abroad. The result of our researches is a considerable change in our views regarding the classification of terrestrial mollusca. Such of these changes as relate to the American families, we purpose stating here, referring always to the page of our work containing the description or statement to be modified.

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[*] Land and Fresh-water Shells of North America, Part I. Smithsonian Institution, Feb., 1869.

We restrict our corrections and suggestions to the genera belonging to the fauna of North America, exclusive of that of Mexico and Lower California.

The divisions A and B (p. 2) of Dr. Gray (founded on the head, eye-peduncles and tentacles being retractile under the skin, or contractile) cannot be retained, as the recent observations of Stoliczka have proved the eye-peduncles of *Onchidium* to be really retractile. The same may possibly be true of *Veronicella.*

The sections 1, Vermivora and 2, Phyllovora are equally untenable. There is not the difference in food indicated by these names. For instance, no species can be more carnivorous than *Stenogyra decollata,* which is always placed among the herbivorous genera. *Limax maximus,* also, we have known to devour its kind, though it is ranked in the same section. The first instance shows how incorrectly the aculeate marginal teeth alone are called of carnivorous type, as they are entirely wanting in *Stenogyra decollata.*

The presence or absence of a jaw is not a reliable character to sustain the distinction of these sections. *Helix inæqualis,* for instance, has no jaw.

The teeth are equally unreliable, inasmuch as all our species of *Macrocyclis,* placed in section 2, have teeth like those described in section 1. So have *Helix inæqualis, Hyalina Baudoni* and *Gonospira palanga.* Moreover, some genera show a gradual change from the so-called herbivorous to the so-called carnivorous type of teeth. Thus in *Glandina* and *Macrocyclis* we find the carnivorous type only; in *Zonites, Vitrina* and *Limax* the marginal teeth are carnivorous, and occupy the greater part of the membrane, but the few laterals are of the herbivorous type. In *Zonites cellarius* the latter are greatly modified and resemble closely the carnivorous type. The membranes of *Vitrina limpida* and *Zonites chersinus,* however, by the increased number of laterals and the bifurcation of the marginals, are more nearly related to the herbivorous type. Thus, instead of the difference of food, of the presence or absence of a jaw, of the aculeate or quadrate form of teeth, supposed to exist between the Vermivora and Phyllovora, we find these characters shared irregularly by both sections, and consequently we abandon them.

OLEACINIDÆ (p. 13).—In the description of the teeth the term aculeate, rather than recurved, better expresses their thorn-shaped outline. In our descriptions of the lingual membranes, we have often called these teeth *uncini*, and with less judgment used the same term for the quadrate marginal teeth of some of the *Helicidæ*. It would be better in all cases to retain the names central, lateral and marginal for the three forms of teeth.

CYLINDRELLIDÆ.—We no longer consider this a distinct family. Even while our work was passing through the press the presence of a jaw was discovered by one of us.* We also misapprehended the character of the teeth, which have since proved to be simply a modification of the form usual in the *Helicidæ*. We propose, therefore, to place the species referred to *Cylindrellidæ*, and also of *Macroceramus* referred to *Orthalicinæ*, in the family *Helicidæ*, before the genus *Bulimulus*.

Messrs. Crosse and Fischer (Jour. de Conch., January, 1870), after a thorough study of the jaws and lingual membranes of numerous species, proposed to separate the *Cylindrellidæ* as a family, supporting their views entirely upon the jaw and teeth, both of which we have found unreliable. The kind of jaw supposed by them to be peculiar to the family has been detected by us in various species of *Bulimulus*, and in one of *Helix* (see Ann. Lyc. N. H. N. Y., x., 79). The type of palmate teeth, also, which Messrs. Crosse and Fischer describe as characteristic of the family is not constant, as we find it entirely wanting in *Macroceramus Gossei*. (See American Journ. of Conch. vii, pl. 17, figs. 9, 11, 12.)

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* **Bland, Amer. Jour. of Conch. IV. 1868.**

CYLINDRELLA (p. 22).—In this genus there is a jaw, thin, almost membranous, light horn color, semitransparent, arched, ends but little attenuated; in one single piece, but divided by delicate ribs into numerous oblique plates,* chevroned on the central line, with a median triangular plate at the top; cutting edge simple; no beak.

The teeth are not joined two by two at their bases. They are distinct as in the other *Helicidæ*. The centrals are small, long, narrow, with a broadly recurved, blunt, rounded and expanded apex; the laterals have a long, subquadrangular base of attachment, bearing, below, a large, bluntly rounded, greatly expanded, palmate cusp, representing the inner and central cusps of the laterals; and, above, a long, slender, graceful cusp, representing the external cusp of the other *Helicidæ*. This last is bluntly truncated, or bears a recurved cusp, smaller but of same shape as that below; or it has a laterally extended, small, blunt point. In some species the laterals extend to the margin of the lingual membrane; in others there are distinct marginal teeth, long, narrow, laminar, with bluntly recurved apices. A full description and figures of these various forms of teeth will be found in Journal de Conchyliologie, Jan., 1870.

HOLOSPIRA (p. 24).—Messrs. Crosse and Fischer, in the article on *Cylindrellidæ*, referred to above, have shown that *Holospira* is a distinct genus from *Cylindrella*.

The jaw is arcuate, about the same shape as in *Cylindrella*, thin, light horn colored, without separate plates or anterior ribs; with obsolete striæ, transversal and vertical; cutting edge simple, without a median beak.

The lingual membrane wants entirely the chevron-shaped rows of teeth and the palmate form of cusp, characteristic of *Cylindrella*. It resembles that usual in the *Helicidæ*, the lateral teeth not unlike those we have figured of *Bulimulus pallidior* (Ann. Lyc. N. H. of N. Y., ix., p. 282).

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* As in *Helix turbiniformis*, not as in *Orthalicus*. (See Ann. N. Y. Lyc., x., 79, pl. ii. fig. 2.)

The genus *Holospira*, with the two species *H. Röemeri* and *H. Goldfussi*, must be placed, together with *Cylindrella* and *Macroceramus*, as already mentioned with regard to those genera, in the family *Helicidæ*.

MACROCERAMUS.—In this genus the jaw and lingual membrane are as in *Cylindrella*, and our description (page 219) must be cancelled. In *M. Gossei*, however, the teeth are the same as in *Helix*, with bluntly pointed denticles, one long and the other short, as shown in our above referred to figure.

HELICIDÆ (p. 25).—More recent investigations have satisfied us that the presence of a mucus pore is not in itself a character to warrant the separation of the *Arionidæ* as a family. It has been shown that the pore exists, with various modifications, in many species of *Geophila* where it was not before suspected, for instance in *Helix pylaica*, *Glandina ligulata* (*Petenia*, Crosse, Journ. Conch. 1869, p. 35), *Glandina monilifera* (Morelet, ibid., 1852). Unless, then, we are prepared to consider these species as belonging to a family distinct from *Helix* and *Glandina* respectively, we cannot separate the *Arionidæ* from the *Helicidæ* on account of the presence alone of the mucus pore.

The description of the foot of *Helicidæ* (p. 25) should be modified by the addition of the following words: "or with a distinct locomotive disk," and "or with a caudal mucus pore."

To the description of the jaw must be added the words "or with one upper, accessory plate. Jaw sometimes wanting." The last reference is necessary to embrace such cases as *Helix inæqualis*, a species, however, which may be proved to belong to another family.

As a basis for grouping the large number of genera of *Helicidæ* into subfamilies, we retain the characters of the jaw and teeth, but with some modifications, as shown in the following synopsis. The subfamily *Pupinæ* is entirely suppressed, as it has been shown that no reliance can be placed on the median beak-like prominence to the cutting edge of the jaw, or on the presence or absence of striæ or ribs on its anterior surface, at least as subfamily characters. We have recognized, therefore, at present three forms of jaw only, viz.: 1st, simply in one piece; 2d, in one piece, with an upper accessory plate; 3d, in numerous separate, free, imbricated pieces. Some modifications even in these distinctions will, we believe, soon prove necessary, as several forms of accessory plate have already been noticed,* and the jaw of *Punctum*, figured by us on p. 222, is a modification of that of *Orthalicus* figured on p. 215.

We admit two distinctions on the lingual membrane for the purpose of grouping the genera into subfamilies, viz.: marginal teeth conical, separate, aculeate; and marginal teeth crowded, quadrate, dentate or serrate.

Based upon these characters we propose the following grouping of the North American genera of *Helicidæ*:†

VITRININÆ. Jaw in one piece. Marginal teeth separate, conical, aculeate.—Macrocyclis, Zonites, Hyalina, Vitrina, Limax.

HELICINÆ. Jaw in one piece. Marginal teeth crowded, quadrate, dentate or serrate.—Arion, Ariolimax, Binneia, Patula, Helix, Holospira, Cylindrella, Macroceramus, Bulimulus, Cionella, Stenogyra, Pupa, Vertigo.

ORTHALICINÆ. Jaw composite, in numerous, free, imbricated pieces. Marginal teeth crowded, quadrate, dentate or serrate.—Orthalicus, Liguus, Punctum.

SUCCININÆ. Jaw in one piece, with one upper accessory plate. Marginal teeth crowded, quadrate, dentate or serrate.—Succinea.

Subfamily VITRININÆ (p. 25).—The following description is to be substituted for that given:

Jaw in one piece, smooth, usually striated, never ribbed, with a beak-like median projection to its cutting edge. Lingual membrane, with separated, conical, aculeate marginal teeth.

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* See Eucalodium, Journ. de Conch., 1870, pl. v, fig. 1.

† Gill, in fact, embraces in his section *Holognatha*, all the genera included in our subfamilies *Vitrininæ* and *Helicinæ* with the exception of *Bulimulus*, regarding which he adopts the views of Albers and von Martens, placing it in the section *Goniognatha*, with *Orthalicus*. (Arrangement of the Families of Mollusks, Washington, 1871.)

Genus HYALINA (p. 29).—We have already stated our views relative to the value of the caudal mucus pore as a family character, and in consequence unite the *Arionidæ* to the *Helicidæ*. This brings the genus *Zonites* next to the genus *Hyalina*. The two genera are very nearly allied, their only distinction, so far as known to us, being in the presence in *Zonites* of a distinct locomotive disk to the foot, and of longitudinal furrows along the side of the animal near its base, rising over the top of the tail and uniting above a terminal mucus slit or pore. (See fig. 524, p. 292.) This difference is considered of generic value by most authors,* among others by Albers and v. Martens, whose descriptions of genera we adopted in our work. They place, however, in the genus *Hyalina* many species which are known to possess the mucus slit (or some modification of it), as *H. olivetorum* and *H. nitida* (see Moquin Tandon), and *H. fuliginosa*, *lævigata*, *inornata*, *suppressa* (see Terr. Moll. U. S., ii). We have ourselves observed it in the following additional species, *H. cellaria*, *viridula*, *indentata*, *intertexta*, *ligera*, *demissa*, *capsella*, *lasmodon* and *multidenta*, and in *Zonites kopnodes*, *sculptilis* and *gularis*. Its having been overlooked by many European authors in so common a species as *cellaria*† leads to the supposition that it really exists also in other species now referred to *Hyalina*. We propose, therefore, to place in the genus *Zonites* the species in which the caudal mucus pore or slit has been actually observed, restricting *Hyalina* to those without it. We have not had an opportunity of examining all the species, but have failed to discover any pore in Tennessce specimens, received from Miss Law, of *H. interna;* it may, however, have escaped our notice, being often difficult of detection.

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* But not by Messrs. Fischer and Crosse in their magnificent work "Études sur les Mollusques Terrestres et Fluviatiles du Mexique et du Guatemala" (page 150), where *Zonites* and *Hyalina* are considered generically identical.

† No mention of the caudal mucus gland in *Z. cellarius* is made in the monographs of Draparnaud, Moquin-Tandon, Reeve, Forbes and Hanley, Gray or Gwyn Jeffreys.

The orifice of generation in the genus *Zonites* is said to be at the base of that of respiration, below the collar, and not below the right eye-peduncle as in *Helix*. It may be much doubted, however, whether this be a constant generic character, as it is found in some species of the former much nearer to the head than the collar.

The dart sac and dart were observed by us in specimens of *Zonites demissus* and *Z. Elliotti*. They have also been noticed by Mörch (Moll. Dan.) in *Zonites* (*Oxychilus*) *nitidus*. The description of Albers and v. Martens must therefore be modified, as well as Moquin Tandon's assertion that no species of *Zonites* has the dart.*

Subfamily HELICINÆ.—The following description is to be substituted for that given at p. 67.

Jaw in one piece, either smooth, striated, or ribbed, with or without a median beak-like projection to its cutting edge. Lingual membrane with crowded, quadrate marginal teeth, either dentate or serrate.

The ribs are found in every degree of development, passing quite across the jaw and denticulating one or both margins, or only developed on the lower portion of the jaw, and crenellating the lower margin. The ribs are often almost obsolete, or represented by wrinkles or coarse striæ. They are present on the anterior surface of the jaw only, or on both anterior and posterior surfaces. They are distant, narrow, stout, few, or crowded, broad, stout and numerous. Their number is inconstant in the same species. They sometimes are very broad, and seem like separate plates soldered to the anterior surface of the jaw, or to be formed by a folding of the jaw upon itself. When this appearance of folding into plaits is given it will generally be found that the plait-like sections are actually separated by distinct, but delicate ribs. When by this form of ribs the jaw is divided into separate compartments, these compartments or plates are either vertical or inclined obliquely towards the median line of the jaw. Sometimes this last arrangement is developed to such a degree that the oblique lines of separation, or delicate ribs, of the plates meet before reaching the bottom of the jaw, and a triangular plate is left at the upper centre of the jaw, its base being upward. This form of jaw is usually thin and membranous. It has been considered the characteristic of the subfamily *Orthalicinæ*, or of the *Goniognatha* by most authors. We, however, can treat it only as a modification of the usual form of ribbed jaw, inasmuch as we find it in various degrees of development in *Bulimulus*, *Bulimus*, and even in *Helix*.* It will be seen below that we restrict the *Orthalicinæ* to those genera whose jaw is in actually free, imbricated pieces.

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* Hence, probably, Draparnaud correctly reports its presence in *Helix algira*.

When the jaw is striated and not ribbed, the striæ are vertical, or they converge towards the median line, as do the plates in *Macroceramus* and *Cylindrella*. There are often transverse striæ also.

The upper margin of the jaw is often extended into a stout membranous attachment, apparently of the same material and consistency as the jaw itself, and showing the same continuity of structure by the striæ of the jaw extending into it without interruption.

The jaw is found in every degree of consistency, very thick in most species of *Helix*, quite membranous and almost transparent in some of *Bulimulus*, in *Macroceramus* and *Cylindrella*.

The cutting margin of the jaw is smooth, crenellated, or denticulated. It is simply concave, or furnished with a more or less developed beak-like median projection.

In shape the jaw ranges from scarcely arcuate, long; low, to horse-shoe shaped, short, high.

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* See our notes on *Helix turbiniformis* in Ann. N. Y. Lyc. x, pl. ii, fig. 2.

We have not noticed in any of the *Helicidæ* the vertical median carina to the jaw, often present in the *Vitrininæ.*

PATULA (p. 71).—We propose to recognize this as a genus, following the more recent decision of von Martens (Preuss. Exp. p. 258). It will take precedence of the genus *Helix.* To the description of the shell and animal already given, we may add that in the American species the jaw cannot be said to be ribbed, as usual in *Helix.* On that of several species, however, there are subobsolete ribs or wrinkles near the cutting edge, which they sometimes crenellate. The prevailing type of jaw seems to be such as we have figured for *P. alternata* (p. 75).

Lingual membrane as figured on p. 75. The marginals, however, are serrate in *P. asteriscus.* In the other species they have one long, inner, oblique, blunt denticle, and one or more short, side denticles.

For the description of the jaw and lingual membrane of the genus *Helix* (p. 69) may be substituted the descriptions given by us above for the jaw and lingual membrane of the subfamily *Helicinæ.* We have noticed in the genus *Helix,* as now constituted, every form of jaw which we have described at length above, except that having angular upper median plates.

With the exception of *Patula,* we still retain the genus *Helix* in the sense in which it is used by Albers and von Martens. With all those who have studied the genus, we are aware that it contains numerous natural groups, many of which appear to be sufficiently well marked to warrant their being recognized as distinct genera; space, however, does not permit of our considering this part of the subject.

Genus BULIMULUS (p. 191).—To the description of the jaw must be added, "often presenting the appearance of separate plates, sometimes arranged obliquely towards the central line, so as to form an upper triangular plate, as in *Cylindrella.*" This last form is usually thin and almost transparent.

Subfamily ORTHALICINÆ (p. 212).—The following description of the subfamily must be substituted for the one given.

Jaw composite, in numerous free, imbricated pieces, usually with oblique sutures towards the centre of the jaw, leaving an upper, angular, median piece. No median projection to the cutting edge, which is serrated by the lower angles of the separate pieces. Lingual membrane with marginal teeth crowded, quadrate, usually broadly dentate.

It will be observed that we include only in this subfamily the genera whose jaw is actually in separate pieces, not those in which the jaw is in one single piece, though in plates formed by the ribs being arranged so as to give the appearance of separate pieces. We do not, moreover, use the term *Orthalicinæ* in the same sense as *Goniognatha* of some authors to comprise all the genera whose jaw has an upper angular, median plate. This last form of jaw is found in *Cylindrella*, *Macroceramus*, *Pineria*, and in some species of *Bulimulus*, but not in *Punctum*. We do not recognize it as of value in dividing the *Helicidæ* into subfamilies. We base this subfamily (*Orthalicinæ*) solely on the free, imbricated pieces of its composite jaw.

The description of the genus *Achatina* (p. 212) is to be entirely omitted. We adopt *Liguus* as a genus, and add the following description of the jaw and lingual membrane.

Jaw arcuate, ends attenuated, pointed; composite, being in numerous separate, free, imbricated, triangular pieces, with sutures inclined obliquely to the centre of the jaw, so as to leave an upper median, angular piece. Cutting edge with no median projection, serrated by the lower angles of the oblique pieces.

Lingual membrane with long, quadrate teeth, pointed or simply with a broad, recurved cusp.

ORTHALICUS.—The following description of the lingual membrane must be substituted for that given at p. 215.

Long, broad, with numerous rows of long, four-sided, narrow, uniform teeth, bearing a broad, expanded, recurved, gouge-shaped cusp.

Genus STENOGYRA (p. 228).—Central teeth of the lingual membrane very small, tricuspid; laterals large, subquadrate, tricuspid, middle cusp very large; marginals subquadrate, obtusely denticulated.

Subfamily SUCCININÆ (p. 255).—To our description of the lingual teeth must be added, "marginal teeth quadrate, crowded, dentate or serrate."

Note on Helix inversicolor Fer. and other species from Mauritius.

While the foregoing paper was being printed, we had, through the kindness of Mr. J. G. Anthony, of the Museum of Comparative Zoology, Cambridge, and of Mr. J. H. Thomson, the opportunity of examining the animals of *Helix inversicolor* Fer., *H. leucostyla* Pfr., *H. rufozonata* H. Ad. and *H. militaris* Pfr., received from Mr. Pike, the United States Consul at Mauritius. The results of such examination are so interesting that we now publish them.

H. inversicolor and *H. militaris* are placed by v. Martens in *Helicacea*, genus *Helix*, the former in the section *Caracolus*, and the latter in *Stylodon*, but both, as well as *H. rufozonata* and *leucostyla*, rather belong to *Vitrinea*, genus *Nanina* of that author's classification. Indeed our figure of the lingual dentition of *Nanina cabias*, Benson (Am. Jour. of Conch. vii, pl. 17, fig. 6), almost equally well applies to the species under consideration, as will be seen from the following description of their dentition.

The jaws stout, arcuate, high, ends slightly attenuated, blunt; anterior surface with no ribs; cutting edge with a decided, blunt, median projection.

Lingual membrane long, broad. Central and lateral teeth in horizontal rows, in shape as usual in the *Helicidæ*. Marginal teeth in oblique rows, aculeate, bluntly bifid, decreas-

ing in size as they pass off laterally. In *Helix militaris* there is about an equal number of laterals and marginals.

The resemblance of these species to the genus *Nanina* holds good also in the external characters of the animal. The tail is long, gradually tapering towards a blunt extremity, which is bifid, being separated into two distinct processes by a transverse, triangular, deeply-seated, mucus pore. There is a distinct locomotive disk to the foot. Down the centre of the back of the foot is a distinct line, from which the granulations run obliquely down to a horizontal line of furrows bordering the edge of the foot. This horizontal line rises over the extremity of the tail, above the process which overhangs the mucus pore.

These species must certainly be removed from the genus *Helix*, and even from the *Helicinæ*, and placed among the *Vitrininæ* in the genus *Nanina*.

X.—*Monographie des Poissons de Cuba compris dans la sous-famille des Sparini.*

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Présenté le 29 Janvier, 1872.

FAMILIA SPARIDI.

La famille des Spares est fondée sur le genre *Sparus* d'Artédi, Genera, p. 35; adopté par Linné et caractérisé principalement par des molaires rondes en forme de pavés sur les côtés des mâchoires. C'est proprement la première tribu de Cuvier, Règne Animal II, p. 181, qui répond aux groupes *Pagrina* et *Sargina* du Dr. Günther, Catalogue, I, p. 412. Ce genre a été conservé par Bloch et par Lacépède, qui y ont fait entrer un grand nombre d'espèces qui ne lui appartiennent pas, surtout le dernier.

Cependant, Cuvier place dans la même famille d'autres tribus qui n'ont pas de molaires arrondies, et qui forment principalement le groupe *Cantharina* du Dr. Günther. Il a donc fallu exclure les dents des caractères essentiels et généraux de cette famille.

Les *Sparidi* sont des poissons à corps oblong et comprimé; ventrales 1, 5; trois épines anales; pièces operculaires sans armure; bouche non protractile, palais sans dents; écailles cténoïdes de médiocre grandeur, n'en ayant pas aux nageoires; queue sans bouclier; les os de la tête sans cavernosités; cœcums peu nombreux. Je passe sous silence d'autres caractères importants, parce qu'il y a des exceptions dans quelques sous-familles; je m'étendrai davantage dans celles de Cuba.

C'est à tort que Linné accorde à ces poissons des pectorales arrondies.

Observations.—Je sépare des *Sparidi* le groupe *Pimelepterina* du Dr. Günther, parce qu'il a sept rayons branchiostèges, et des écailles aux nageoires verticales. Le régime herbivore et les nombreux appendices pyloriques, le rapprochent des Chétodons, près desquels Cuvier l'a placé.

Sous-familles de Cuba.—1. *Sparini;* 2. *Sargini.*

SUBFAMILIA SPARINI.

Cette sous-famille répond au groupe *Pagrina* du Dr. Günther; caractérisé par des dents coniques sur le devant des mâchoires, suivies en dedans d'un groupe de dents en cardes; des molaires rondes sur les côtés. Le préorbitaire, très développé, couvre en partie le maxillaire; la langue est lisse. Dorsale unique, dont la partie épineuse peut se loger dans un sillon du dos. Il y a six rayons branchiostèges. Caudale fourchue, pectorale pointue. Régime carnivore.

Nous pouvons diviser cette sous-famille ainsi qu'il suit:

- I. Premier interhémal non taillé en forme de bec de plume à écrire.
  - 1. Plusieurs rangs de dents molaires.
    - a. Des dents coniques fortes sur le devant des mâchoires.
      - †. Maxillaire non renflé . . . . *Sparus*, Art.
      - ††. Maxillaire renflé . . . . *Lithognathus*, Sw.
    - b. Des dents coniques faibles sur le devant des mâchoires *Pagellus*, Cuv.
  - 2. Deux rangs de molaires, canines fortes . . . . . *Pagrus*, Cuv.
  - 3. Un seul rang de molaires, canines médiocres
    - a. Joues écailleuses . . . . *Sphærodon*, Gthr.
    - b. Joues sans écailles . . . . *Lethrinus*, Cuv.
- II. Premier interhémal taillé en forme de bec de plume à écrire.
  - 1. Plusieurs rangs de dents molaires, pectorales longues, dépassant l'anus, canines plus ou moins fortes . *Calamus*, Sw.
  - 2. Un rang de moins aux molaires, pectorales courtes, n'atteignant pas l'anus, canines faibles . *Grammateus*, Poey.

Les genres *Chrysoblephus* et *Argyrops* de Swainson restent, le premier parmi les Spares, le second parmi les Pagres.

Le genre *Sparus* a été établi en 1738, quoique avec une signification plus étendue, par Artédi, Genera, p. 35; ayant pour type le *Sparus aurata* de Linné. Accepté par Linné, avec la même étendue, il a depuis servi de type à une famille divisée en plusieurs genres, dont aucun n'a conservé le nom primitif, contre l'usage des classificateurs; excepté chez Swainson, qui l'a bien à tort appliqué, en 1839, à un groupe de Sparoïdes sans molaires arrondies. C'est aujourd'hui pour tous les auteurs le genre *Chrysophrys* de Cuvier, Règne Animal, II, p. 181, 1829; nom que la loi de la priorité nous oblige à faire passer sous le joug de la synonymie.

Cuvier et Valenciennes ont fait entrer dans le genre *Pagellus* les espèces des Antilles, qui sont toutes pourvues de plume, du moins celles de Cuba; mais Mr. Guichenot, dans sa *Révision du genre des Pagels*, les en a séparé pour les placer dans le genre *Calamus* de Swainson.

De même que les *Sparini* sans plume ont été divisés en plusieurs genres, d'après le nombre et la forme de leurs dents, il paraît que nous devrions aussi diviser les *Sparini* à plume d'après les différences analogues et non moins remarquables de leur dentition. Mais malgré ces différences chez les poissons à plume de Cuba, je ne me trouve pas disposé à introduire de nouvelles coupes génériques aux dépens du genre *Calamus;* ayant toutes le désavantage de ne pouvoir traduire au dehors le caractère général, qui consiste dans une modification de l'interhémal, servant d'entonnoir à la vessie natatoire. On verra cependant que j'ai fait une exception.

Genus CALAMUS.

Historique.—Ce genre a été établi par Swainson, en 1839, dans *The Nat. Hist. of Fishes, Amphibians and Reptiles,* II, p. 221, comme sous-genre de *Chrysophrys*, ayant pour type le *Pagellus calamus* de Valenciennes, dans Cuv. et Val. Histoire des Poissons, VI, p. 206, pl. 152; sous les caractères suivants: "Head very large; profile abruptly oblique; dorsal fin slightly emarginate in the middle; the second anal spine hollow and shaped as a pen; pectoral large." La seconde épine anale est sans doute un *lapsus* de l'auteur, qui a voulu dire le deuxième interépineux, lequel soudé au premier, est creusé en entonnoir pour recevoir la vessie aérienne. Mr. Guichenot (1868) adopte ce genre dans sa Révision du genre des Pagels, et l'applique, sans distinction de dents, à tous les Sparoïdes à plume de la sous-famille des Sparini.

Etymologie.—*Calamus*, plume à écrire.

Caractères du genre.—Corps élevé vers la nuque, œil haut, museau oblique, anus arrièré; bouche petite, mâchoire inférieure un peu arrièrée; symphyse sans pores, membrane branchiostège n'arrivant pas à l'articulation de la mâchoire inférieure; narines près de l'œil, rapprochées, l'ouverture postérieure sur une fente longitudinale, oblique, l'antérieure très petite. Le maxillaire prolonge à son angle antérieur une éminence, qui forme une corne à l'extérieur.

Dents.—Le devant des mâchoires porte un groupe de dents en cardes, qui avec l'âge deviennent grenues; le rang extérieur est toujours plus robuste, et se compose de dents plus ou moins coniques et crochues, quelquefois très fortes, comme des dents canines, et alors en petit nombre. Les dents latérales sont arrondies en pavé, sur trois rangées principales en haut et deux en bas; la seconde d'en haut est formée de tubercules plus petits. Celles du troisième rang, en haut, et du second en bas, sont les plus grosses, surtout celles du fond de la bouche. Il y a encore une ou deux courtes rangées de tubercules plus internes, qui deviennent plus nombreux dans l'âge adulte, mais qui existent toujours. Les premières molaires de la rangée externe ont leur couronne un peu conique, quoique courte. Le nombre de séries dentaires donne à la bouche un diamètre plus grand que dans le genre qui suit. Les dents pharyngiennes sont en cardes fortes et courtes.

Nageoires.—La dorsale a onze piquants, sa portion molle a peu d'étendue; l'anale est beaucoup plus longue que haute, la ventrale est sans membrane axillaire, et porte au-dessus de sa base une écaille lancéolée; la pectorale est longue et pointue, atteignant l'anale.

Ecailles.—Les écailles ont leur bord libre presque entier. La tête en est dépourvue, sauf aux pièces operculaires; il y en a un groupe étroit sur la joue, et non pas sur le limbe du préopercule; il n'y en a pas aux nageoires. L'écaille surscapulaire, extrêmement amincie, est à peine visible en dehors; de là part une série d'écailles qui remontent obliquement sur la nuque, et qui sont fortement striées.

Squelette.—Je prends pour type de cette déscription le *Calamus Bajonado.* Le crâne, vu en dessus, est médiocrement élargi en arrière et entre les deux orbites. La crête suroccipitale est haute, et son angle est aigu: les deux autres crêtes sont très-basses. L'orbite, rejeté en arrière, laisse un espace très court pour la cavité encéphalique. L'apophyse préfrontale est très saillante, et percée en dessus d'un trou aveugle infundibuliforme, portant des points d'articulation hauts et aplatis. L'apophyse préfrontale n'existe pas : il y a plus bas une lame qui limite l'orbite en arrière. Les ouvertures externes du nerf trijumeau sont marginales ; la postérieure très-grande, percée sur une voûte horizontale de l'alisphénoïde ; il y a de plus un petit trou au-dessus des deux cavités, très rapprochées, qui reçoivent l'épitympanal. La convexité otocranienne n'est pas visible en dehors. La base du sphénoïde descend beaucoup et se bifurque ; plus en avant, il y a une grande échancrure, et son bord devient tranchant, à cause du grand amincissement du préfrontal et du nasal ; celui-ci porte au-dessus la fosse naso-vomérienne. La fosse paroccipito-mastoïdienne est ouverte. La fente basisphénoïdale est bien marquée. L'ouverture antérieure du crâne est ample. Le conduit supérieur de l'ouïe pénètre par le paroccipital et sort par un trou de l'exoccipital, rendu complet par une échancrure du mastoïdien. Le conduit latéral pénètre dans le mastoïdien et aboutit aux mêmes échancrures. L'otolithe est petit et allongé ; n'ayant aucune communication avec la vessie natatoire ni avec la cavité abdominale : le Dr. Günther indique cette communication dans le genre *Sparus*, Catal. I., p. 23 ; mais je ne l'ai pas trouvée dans les sparoïdes de Cuba.

Les sous-orbitaires sont au nombre de six ; les deux premiers, très-amincis, recouvrent l'os maxillaire, qui n'a point de labial. Il y a deux surtemporaux. Le symplectique, ou mésotympanal, bifurqué en bas, appuye une de ses branches sur l'hypotympanal, et l'autre sur le préopercule. Le prétympanal n'a pas de lame apophysaire. L'urohyal est bifurqué.

Vertèbres, 10—14. Les apophyses latérales commencent dès la première, et vont en augmentant ; l'anneau commence à la huitième. La première névrapophyse chevauche ; la seconde est courte ; celles qui suivent ne se distinguent pas beaucoup des autres. Les côtes sont : 2 épicentrales, 8 pleurapophyses, chacune avec une épipleurale, dont les dernières sont plutôt des épihémales ; il y a de plus une épicentrale sur les trois premières vertèbres caudales. La première épine internévrale soutient deux rayons épineux. Il y a trois fausses internévrales suspendues dans les chairs. Le second interhémal, soudé au premier, est creusé en forme de plume.

Viscères.—L'intestin fait les circonvolutions ordinaires. Cœcums peu nombreux. Vessie natatoire fibreuse et forte.

Division.—Les espèces de Cuba, renfermées dans le genre *Calamus* (après en avoir séparé le genre *Grammateus*), peuvent être divisées en quatre groupes, dont je vais donner les caractères, en y rapportant nos espèces.

1°. Ce groupe, pour le nombre des molaires et par la nature des dents coniques, répond parallèlement au genre *Sparus* (*Chrysophrys* des auteurs), trois fortes canines de chaque côté, hors du plan des dents en cardes.—*C. Bajonado.*

2°. Une forte canine oblique ou horizontale, à la mâchoire supérieure; dos très-élevé.—*C. megacephalus.*

3°. Dents coniques faibles; entre elles, une plus forte, verticale.—*C. orbitarius; C. 579.*

4°. Toutes les canines faibles. Ce groupe répond aux Pagels.—*C. macrops.*

Calamus Bajonado—Vulgo Bajonado.

Planche VI., fig. 1.—L'individu représenté a 210 millimètres de long. Les dents sont d'un individu adulte.

Parra, p. 13, tab. 8, f. 1. Bajonado.
Sparus Bajonado Bloch, Syst. Ichth., p. 284.—1801.
Sagra, Atlas MSS., tab. 53. Bajonado.
? *Pagellus penna* Valenciennes, in Cuv. et Val. Poiss. VI., p. 209.—1830.
Guichenot, in Sagra, ed. hisp., p. 187. *Pagellus penna.*
Pagellus caninus Poey, Memor. Cuba, II., p. 468.—1861.
? Guichenot, Rév. des Pagels, p. 114. *C. penna.*—1868.
Poey, Synopsis, p. 318. *Sparus Bajonado*; Repert. II., p. 160.

Caractères essentiels.—On le reconnait à son museau prolongé, légèrement arqué en-dessus, son œil assez grand. Les dents canines sont longues et fortes, ordinairement au nombre de trois à chaque mâchoire. C'est de toutes les espèces de Cuba celle qui devient la plus grande ; car les autres ne dépassent pas un pied de long. Le dos est médiocrement élevé ; la hauteur entrant environ 3 fois dans la longueur totale ; chez les individus de 8 pouces, l'œil entre 13 fois dans la longueur totale ; 15 fois chez ceux de 12 pouces. La plume est d'un diamètre médiocre, son bec long. Les lobes de la caudale sont plus aigus que chez les autres espèces du même genre. La joue porte rarement sur le devant des écailles des traits de coloration.

Détails divers.—Les deux premières épines de la dorsale sont faibles. Les rayons mous sont peu branchus aux nageoires médianes ; les premiers de la pectorale sont simples. Les os mandibulaires sont violets. D. 12, 12 ; A. 3, 10 ; trois cœcums courts et lâches.

Couleurs.—Le tronc est gris de plomb tirant un peu sur le violet ; à reflets dus aux contours jaunâtre des écailles. La tête en-dessus est olive assez foncé sur toute la partie nue ; les côtés du museau sont bronzés, rarement parsemés de traits bleus, les écailles des joues en partie dorées. Une bande bleue entoure le dessous de l'œil. La commissure des lèvres est orangée, passant quelquefois au violet. Les nageoires sont pâles. Il y a au-dessus de l'axille pectorale un espace doré. L'iris est nuancé de brun et de jaune. On trouve souvent, dans un âge peu avancé, des bandes brunes verticales au nombre de 5 à 6 sur le tronc, et des bandelettes sur la caudale.

Variétés d'âge.—J'en ai décrit dans les caractères du genre. Chez un individu de 185 millimètres, les dents canines n'ont pas encore atteint la force que l'on remarque chez les adultes ; mais elles n'ont pas perdu leur caractères, ni la petite série interne des molaires.

Comparaison.—Le *Calamus penna* présente la synonymie que j'ai déjà indiquée avec doute. Valenciennes décrit un individu de 6 pouces : Mr. Guichenot n'en a vu que de 80 à 180 millimètres. A cet âge, la hauteur est moindre, les canines sont moins robustes, les bandes verticales existent accidentellement. Mr. Guichenot rapporte ce poisson au *Bajonado* de Sagra, qui appartient évidemment à notre espèce, par la forme du corps, et surtout par celle de la tête. Il lui ressemble encore par la joue, sans traits particuliers de coloration. Cependant, on peut douter que le *C. penna* soit le véritable *Bajonado;* parceque, au dire de Cuvier et de Guichenot, il a l'œil petit et la caudale peu fourchue. Le Dr. Günther le porte avec doute à la synonymie du *Chrysophrys calamus.*

Observations. Il est très remarquable que le *Sparus Bajonado* de Bloch, ni la figure de Parra, à laquelle elle se rapporte, ne soient pas cités dans l'ouvrage de Cuvier et Valenciennes, dans celui du Dr. Günther ni dans la Révision des Pagels de Mr. Guichenot.

Histoire.—Ce poisson est commun et sain, quoique médiocrement estimé: il arrive au moins à un pied et demi de long. On le pêche à peu de profondeur. J'ai trouvé dans ses intestins du sable et des débris de mollusques, ainsi que des fucus.

Numéro 468 de mon Atlas manuscrit.

Calamus megacephalus—Vulg. Pez de pluma.

Pagellus calamus Valenciennes, in Cuv. et Val. Poiss. VI., p. 206, tab. 152.—1830.
Calamus megacephalus Swainson, Nat. Hist. Fishes, II, p. 222.—1839.
Günther, Catal. I., p. 187. *Chrysophrys calamus.* 1859.
Guichenot, Rév. des Pagels, in Mem. de la Soc. Imp. des Sciences Nat. de Cherbourg, vol. XIV., p. 112. *Calamus megacephalus.*—1868.
Poey, Synopsis, p. 208. *Sparus calamus;* Repert. I., p. 314.

Caractères essentiels.—Le dos est très-élevé; la hauteur du corps n'entrant pas deux fois et demie dans la longueur totale. La mâchoire supérieure porte une dent canine forte, dirigée obliquement en avant, au milieu d'autres moins robustes. L'œil est grand, entrant 14 fois dans la longueur totale, chez un individu de onze pouces. La couleur de la peau sur les côtés du museau, est caractéristique. La plume est large, son bec long.

Détails divers.—Cœcums, 4. Vessie aérienne forte, ayant dans l'intérieur de nombreux corps rouges. La bifurcation caudale est peu profonde, lobes élargis.

Couleurs.—La couleur générale résulte de celle des écailles, qui ont le centre verdâtre doré et les contours bleus; elle s'éclaircit en dessous. Les écailles du préopercule sont blanches, bordées de jaune; le limbe est violet. L'isthme est orangé. La tête est brune en dessus. Les côtés du museau ont des taches rondes jaunâtres sur un fond bleuâtre métallique. Les lèvres sont en partie jaunes, avec du bleu sur la commissure. Un trait bleu entoure l'œil en dessous. Les nageoires sont d'un jaunâtre pale; pectorales rose. Iris mêlé de brun et de jaune.

Comparaison.—Le *Calamus pennatula* de Guichenot, Rév. des Pagels, p. 116, de la Martinique, est trop bas pour appartenir à la même espèce; car l'auteur dit que sa hauteur n'a pas le tiers de la longueur totale: elle n'y entre pas même deux fois et demie chez un individu de Cuba de même taille.

Observations.—Il est très-bien representé dans l'ouvrage de Cuvier et Valenciennes; mais il y est peint trop rouge.

Histoire.—Il est rare. Le plus grand que j'ai vu est d'un pied de long. On le trouve aussi à Bahia, Trinité, Jamaïque (Gthr.), Martinique (Val.), Saint Domingue (Guich.)

Numéro 475 de mon Atlas Mss.

Calamus orbitarius—Vulg. Pez de pluma.

Planche VI., fig. 2. Individu figuré: 310 millim.

Pagellus orbitarius Poey, Memor. Cuba, II., p. 201.—1860. Synopsis, p. 308, *Sparus orbitarius.*—1868.

Guichenot, Rév. des Pagels, p. 123, *Calamus orbitarius.*— 1868.

Caractères essentiels.—Museau peu prolongé, hauteur contenue deux fois et trois quarts dans la longueur totale; œil médiocre, contenu 15 fois dans la dite longueur, sur des individus de 10 pouces; une dent canine verticale médiocrement forte à la mâchoire supérieure, au milieu d'autres plus faibles. Plume large, bec très-court. Un trait bleu antéoculaire. Lobes de la caudale élargis, la bifurcation médiocrement profonde. Œil plus brun que jaune.

Détails divers.—D. 12, 12; A. 3, 10 quelquefois 3, 11. Vessie fibreuse, renforcée en dessous: son intérieur laisse voir la première vertèbre à découvert. Cœcums 4.

Couleurs.—La couleur générale résulte de celle de chaque écaille, qui est d'un bleu foncé au centre, jaunâtre doré pâle au pourtour; celles des joues sont blanches. La partie nue du museau est jaune doré sale, les côtés parcourus par des traits bleus circulaires; la bande sous-oculaire est bleue, ainsi que la préoculaire. Les lèvres sont d'une teinte violette; l'isthme est jaune. Il y a sur le tronc brachial une tache bleue. Les nageoires sont jaunâtres. Il y a dans l'œil du brun et du jaune: c'est le brun qui domine. On le trouve quelquefois avec des bandes brunes verticales sur le tronc, peu prononcées, ainsi qui sur la caudale.

Comparaisons.—Ce n'est pas le *Calamus pennatula*, Guich. Rév. des Pagels, p. 116, dont la mâchoire supérieure est munie de deux dents canines proclives en avant.

Ce n'est pas le *Calamus plumatella*, Guich. Rév. des Pagels, p. 120; lequel est moins haut, le profil du museau moins vertical, l'œil plus grand, les canines de la mâchoire supérieure toutes égales et fortes, joues sans traits de coloration, caudale bordée postérieurement de brun ou de noirâtre.

Ce n'est pas le *Calamus penna* Val., in Cuv. et Val. Poiss. VI., p. 209; Guich. R. des P., p. 114, dont la hauteur est moindre, la joue sans traits de coloration, dents et plume distincts. La caudale est moins fourchue et ses lobes sont obtus. Il y a une bande verticale qui descend à travers l'œil sur la joue.

Erratum.—Je dis dans mes Mémoires que la quatrième série de molaires de la mâchoire supérieure n'existe pas dans cette espèce: c'est une erreur que j'ai corrigée dans ma Synopsis.

Histoire.—L'espèce est commune, et n'atteint pas un pied de long. J'ai trouvé dans l'estomac des débris de Mollusques, des astéries et des annélides.

Numéro 149 de mon Atlas Mss.

Calamus macrops — Vulg. Pez de pluma.

Planche VII., fig. 3. Individu figuré: 220 millim.

Caractères essentiels.—Le corps est haut, sa hauteur contenue deux fois et deux tiers dans la longueur totale; et l'œil contenu 13 fois: le tout chez les individus de 10 pouces. Les dents canines sont faibles, au nombre de 5 à 6 de chaque côté, et d'égale force. Plume d'un diamètre médiocre, son bec plus long que le tuyau. Elargissement et bifurcation de la caudale médiocres. Il n'a pas de bandelette bleue antéoculaire. Voyez plus bas la couleur des yeux.

Couleurs.—Gris de plomb, avec une tache bleu-clair au centre de chaque écaille du tronc. La tête est olive assez foncé en dessus, doré verdâtre sur les côtés, parcourus par des traits bleus. Bande sous-oculaire bleue. La mâchoire inférieure est bleuâtre, commissure jaune. Isthme couleur de paille. Nageoires pâles. Un point bleu axillaire au dessus de la base de la pectorale. Il y a dans l'œil du brun et du jaune: c'est le jaune qui domine.

Comparaison.—Quoique par la grandeur de l'œil il se rapproche du *Calamus plumatella* de Mr. Guichenot, plus que le *C. orbitarius*, ce n'est pas encore la même espèce, par les raisons déja exposées. Il s'en sépare davantage par les canines de la mâchoire supérieure.

Histoire.—Ce poisson est commun.

No. 221 de mon Atlas Mss.

Calamus 579.

Caractères essentiels.—Il ne diffère du *Calamus macrops* que par les dents, qui sont comme chez le *C. orbitarius.* La plume est large, son bec long.

Ce n'est pas le *Calamus plumatella* Guich. dont il est question aux deux espèces antérieures.

Je ne donnerai un nom à cette espèce, qu'après en avoir vu un grand nombre d'individus.

Genus GRAMMATEUS.

Ce genre ne diffère du *Calamus* que par les dents molaires, qui manquent de série interne; laquelle, chez ce dernier genre, forme le quatrième rang en haut, et le troisième en bas; et de plus, par la pectorale courte, n'atteignant pas l'anus.

Etymologie.—γραμματέυς, scriptor.

Grammateus humilis—Vulg. Pez de pluma.

Sagra, Atlas Mss., tab. 51.—1834. Salgo (lege Sargo).
Pagellus microps Guichenot, in Sagra, ed. hisp., p. 188, tab. 3, fig. 1 (dentibus molaribus erroneis). 1843.
Pagellus humilis Poey, Synopsis, p. 308.—1868.
Guichenot, Rév. des Pagels, p. 118. *Calamus microps.*—1868.
Günther, Catal. I., p. 417. *Pag. microps.* 1859.

Détails divers.—Le sixième sous-orbitaire n'est pas encaissé. La corne du maxillaire est à peine sensible. D. 12, 12; A. 3, 11. L'œil est contenu 21 fois dans la longueur totale, et la hauteur du corps 3 fois; le tout chez un individu de 275 millimètres. La plume est d'un diamètre médiocre, le bec plus long que le tuyau. L'intestin est étroit, sans strangulations. Cœcums, 4. Vésicule du fiel prolongée; lobe gauche du foie plus long que l'autre. Mon nom spécifique se rapporte à la nageoire anale, qui est très basse.

Couleurs.—Plombé verdâtre. Il y a au milieu de chaque écaille un reflet plus clair; les bords sont verdâtres: celles des joues sont d'un doré pâle. La mâchoire inférieure est violette. La pectorale est jaunâtre, la ventrale tirant sur le violet; les autres nageoires d'un verdâtre pâle. Une tache de bleu foncé sur la partie supérieure de la base de la pectorale. La bandelette bleue sous-oculaire peu prononcée. Il y a dans l'iris du rouge et du brun.

Observations.—Mr. Guichenot, dans l'ouvrage de Sagra, a la priorité; mais il l'a perdue par la description erronée des dents molaires, qu'il dit être sur deux rangs à la mâchoire supérieure; ce qui m'a empêché de reconnaître l'espèce. Il a corrigé l'erreur dans sa Révision des Pagels, publiée dans le 14ᵉ volume des Mémoires de la Société Impériale des Sciences de Cherbourg, de 1868. Ma livraison du *Repertorio*, qui contient ma Synopsis, est de Mars 1868. Il est vrai que, dans ma Synopsis, j'ai commis aussi une erreur, que je corrige plus bas; mais Mr. Guichenot n'ayant pas encore connaissance de mon travail, comme on peut le remarquer dans sa page 123, il n'a pas pu être par moi égaré dans la détermination de l'espèce.

Errata.—Dans ma Synopsis, p. 309, ligne 4, il est dit qu'on trouve de moins la petite rangée de molaires intermédiaires; lisez internes. Et ligne 17, où il est dit que les molaires sont sur deux rangs, non séparés par un rang de petites dents intermédiaires, lisez trois rangs en haut et deux en bas, ces dernières non séparées par un rang intermédiaire.

Histoire.—L'espèce n'est pas rare, sans être commune. Sa taille est d'environ 10 pouces.

Numéro 288 de mon Atlas Mss.

Grammateus medius — Vulg. Pez de pluma.

Planche VII., fig. 4. Individu figuré: 180 millim.

Caractères essentiels.—Il diffère du *Grammateus humilis* par un œil plus grand, contenu 17 fois dans la longueur totale, chez un individu de 273 millimètres, et 16 fois chez un de 180 millimètres. La plume est beaucoup plus étroite, le bec plus long que le tuyau.

Détails divers.—La corne du maxillaire est à peine sensible. Ligne lat. 45.

Variétés.—J'ai dans un exemplaire D. 12, 12; A. 3, 10; dans un autre A. 3, 14. Dans *un* individu, je ne découvre pas la bande bleue sous-oculaire.

Histoire.—Il n'est pas rare, sans être commun. Quelques pêcheurs le nomment *Sargo*, quoique ce soit un poisson à plume. Le plus grand que j'ai vu est de 12 pouces.

Numéro 192 de mon Atlas Mss.

XI.—*Descriptions of New Species of Birds of the Genera Icterus and Synallaxis.*

BY GEO. N. LAWRENCE.

Read April 22d., 1872.

Icterus formosus.

Male. Throat, space in front of the eye and a broad band across the back black; the rest of the plumage of the body is of a beautiful reddish-orange; tail black, the outer two feathers on each side end narrowly with dull white, the bases of the feathers concealed by the coverts are light yellow, with that portion of their shafts white; quills brownish-black, the smaller wing coverts are deep orange, the upper row ending with black, the middle coverts are white, the larger are black with the terminal half of the margins of their outer webs white, the primaries have their outer webs at the base white for a short space, forming a spot, beyond which they are narrowly edged with white, the secondaries have their outer margins broadly white; under wing coverts orange, inner webs of quills for two-thirds their length from base grayish-white; "iris brown; bill black, base of lower mandible and feet light plumbeous."

Length (skin) 8 in., wing $4\frac{1}{4}$; tail $3\frac{7}{8}$; bill from front $\frac{3}{4}$; tarsi $\frac{15}{16}$.

The female has the upper plumage of a dull yellow, brighter on the front; the back is olivaceous, on which part the centres of the feathers are black, giving it a distinct spotted appearance, somewhat as in *I. pustulatus;* the tail is greenish-olive; the throat is black and the under plumage of a clear bright yellow.

A young male has the yellow coloring more orange, with the centres of the dorsal feathers black, but the spots are much larger and closer than in the female. A young male of *I. pustulatus* before me, has the back similarly marked, but the spots are smaller and the upper plumage is more olivaceous. The general plumage of the adult female and young male of *I. pustulatus*, is much duller and more olivaceous than that of the new species of corresponding sex and age.

Habitat. "Tehuantepec (Tuchitan)."
Collected by Prof. F. Sumichrast. Type in Museum of Smithsonian Institution.

Remarks. The adult male above described, was in a collection recently received from Prof. Sumichrast, the others were in his former consignments and have been considered *I. pustulatus*, the markings on the back of the female and young male being somewhat like those of that species; but the two are shown to be very distinct on comparing the adult males—the back of the present species is crossed by a broad black band, whereas that of *I. pustulatus* is orange, the centres of the feathers marked with narrow ovate spots of black; in the new species the deep orange color above continues without change until it joins the black of the back, in *I. pustulatus* the deep color is restricted to the fore part and sides of the head. This species really comes nearest to the bird from Guatemala named *I. sclateri* by Mr. Cassin (which he says is *I. mentalis*, Scl. nec Less.); from this it differs in being smaller and of a much deeper orange color, the outline of the bill is more curved, that of *I. sclateri* being nearly straight; the bases of the feathers which form the black mantle are white tinged with yellow in *I. sclateri*, in *I. formosus* they are grayish-white except immediately adjoining the black ends of the feathers, where they are orange, this color showing a little on the edges of the feathers of the upper part of the mantle.

This bird is almost a miniature of *I. gularis*, differing only in the mantle of that species being of a uniform black, and having the bases of the black feathers grayish-white, without any portion of them yellow.

Synallaxis maculata.

Head above and hind neck brown, back brownish-rufous, rump and upper tail coverts rather brighter; tail rufous with a blackish wash on the inner webs of the two central feathers at their ends; superciliary streak white; throat, breast, sides of the head and of the neck grayish-white, the throat is immaculate but the feathers of the other parts have blackish-brown centres, giving them a very distinct spotted appearance; abdomen and under tail coverts light rufous; quills blackish-brown, wing coverts and edges of inner quills bright rufous; false wing black; bend of wing white; under wing coverts grayish-white tinged with rufous, inner webs of quills for their basal half of a very light salmon color, their terminal half edged with light rufous; upper mandible dark brown, the under yellowish-white, dusky at the end; tarsi and toes dark brown.

Length (skin) $5\frac{1}{2}$ in.; wing 2; tail $2\frac{3}{8}$; bill $\frac{7}{16}$; tarsi $\frac{11}{16}$.

Habitat. Province of Tumbes, Peru.

Type in Museum of Vassar College, Poughkeepsie.

It was in a small collection received by Prof. Orton and placed in my hands for examination.

Remarks. In colors and general appearance this species resembles *S. guianensis*, but the wings are shorter; *S. guianensis* is darker below and has the tail of a deeper rufous, without the dusky markings on the ends of the central feathers; the new species can easily be distinguished by the decided superciliary stripe, and the small spots on the sides of the head and of the neck, and on the breast.

XII. *Description of a New Species of Mollusc of the Genus Helicina.*

BY THOMAS BLAND.

Read April 22nd, 1872.

Helicina gloynei, nov. sp.

T. subglobosa, tenuis, pellucida, pallide cornea, epidermide lineis spiralibus, confertis, pilosulis induta, sub epidermidem nitida, striatula, lineis microscopicis concentricis decussatula; spira parum elevata, apice acutiusculâ, rufescente; anfr. 4½, convexiusculi, ultimus rotundatus, seriebus 5 angustis fusco-pilosis longioribus ornatus, basi impressus; columella breviter recedens, compressa, alba, callum tenuem, album emittens; apertura vix obliqua, semicircularis; perist. tenue, margine dextro breviter reflexo, basali cum columellâ angulum formante. Operc. ?

Shell subglobose, thin, pellucid, pale horn colored, with epidermis having closely set spiral lines of short hairs, beneath the epidermis shining, delicately striate, and with microscopic spiral lines; spire slightly elevated, apex rather pointed and tinged with reddish color; whorls 4½ rather convex, the last rounded and ornamented with five spiral series of longer dark hairs, base impressed; columella shortly receding, compressed, and with thin white callus over the umbilical region; aperture scarcely oblique, semicircular; perist. thin, the right margin slightly reflected, basal margin forming an angle with the columella.

Diam. maj. 9, min. 7, mill. Alt. 5, mill.

Habitat. Newcastle, in the Parish of St. Andrews, Jamaica, West Indies, at an elevation of about 4,000 feet above the sea.

Remarks. This interesting species is very unlike any other hitherto found in Jamaica. It has the hirsute character of *Alcadia hirsuta* C. B. Adams, of that island, and in that respect, as well as in general form has, to a remarkable degree, the aspect of a *Schasicheila*, without, however, the incised peristome.

I am indebted for this, as well as many other species, to my valued correspondent Mr. C. P. Gloyne, R. E., who refers to it, the specific name having been communicated by me, in his Notes on the Land Shells of Jamaica, Jour. de Conchyliologie XII, p. 44. January, 1872.

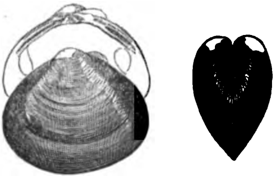
XIII.—*Notes on specimens of Corbiculadæ in the Cabinet of the Jardin des Plantes at Paris, and on the authorship of the Encyclopédie Méthodique.*

BY TEMPLE PRIME.

Read May 6th, 1872.

I had the opportunity, in 1871, of making notes on some of the *Corbiculadæ* in the Jardin des Plantes, which I am induced to publish in the hope that their perusal may lead to the correction of some errors prevalent in regard to the species of this family.

Cyrena orientalis, LAMARCK.



Corbicula Japonica.

This species, described in 1818*, is represented by a single valve, which I found to agree with the shell which I published† under the name of *Corbicula Japonica.*—Lamarck's species is represented as coming from China, mine is a native of Japan.

We cannot, however, decide as yet positively that the *orientalis* and the *Japonica* are identical, for the reason that Lamarck refers to his type as being in his own Cabinet, which is at present at Geneva.

Cyrena truncata, LAMARCK.

Lamarck in his description‡ of this fossil species stated that it came from the State of New York. There is one valve of the *truncata* which evidently belongs to the Tertiary; it is intermediate between *antiqua* and *cuneiformis* of Europe.

As already stated on a previous occasion § I doubt the fact of this species having been found in N. Y., but think that, if it came from America at all, which I hardly believe, as it is so unlike any of our known fossil *Cyrenæ* or rather *Corbiculæ*, it is a native of one of our Southern States.

---

* Lam. An. v, 552, 1818.

† Ann. Lyc. N. H. N. Y. viii, 68, f. 15, 1864.

‡ Lam. An. v, 553, 1818.

§ Smith. Inst. Misc. Coll; Prime, Monog. Corb. 7, 1865.

The *truncata* is labelled as having been purchased from the collection of *Valenciennes* (the father of the late Prof. Valenciennes).

Cyrena oblonga, Quoy.

M. Deshayes has stated* that this species, a native of Vanikoro, has a sinus. I called attention † to this fact, remarking that it was the only instance on record of a non-American *Cyrena* possessing a sinus, qualifying my statement, however, with the reservation, that I had never seen any specimen of *oblonga*.

On an inspection of the specimen of the *oblonga* at the Jardin des Plantes, I detected at once that the so-called *Cyrena* was nothing more or less than a *Glauçonome*.

I am enabled consequently to uphold the proposition, that none of the non-American *Cyrenæ* have an unbroken pallial impression.

Cyrena placens, Hanley.

Elsewhere ‡ I have quoted Mr. Hanley to the effect that there was a specimen of this species at the Jardin des Plantes. As the *placens* is not personally known to me, I sought for the specimen in question with some eagerness; unfortunately, it was not to be found.

Note on the "Encyclopèdie Mèthodique."

Being frequently obliged to consult this work, I was much puzzled to know whether the name of the genus, in many cases a new one, at the top of the plate, was the only evidence of the publication of the genus, or whether there existed some published record of the same not so widely distributed as the plates of the Encyclopédie, and to clear up my uncertainty I entered into correspondence with M. Crosse the manager of the Journal de Conchyliologie.

---

*Lam. An. Desh., edit.

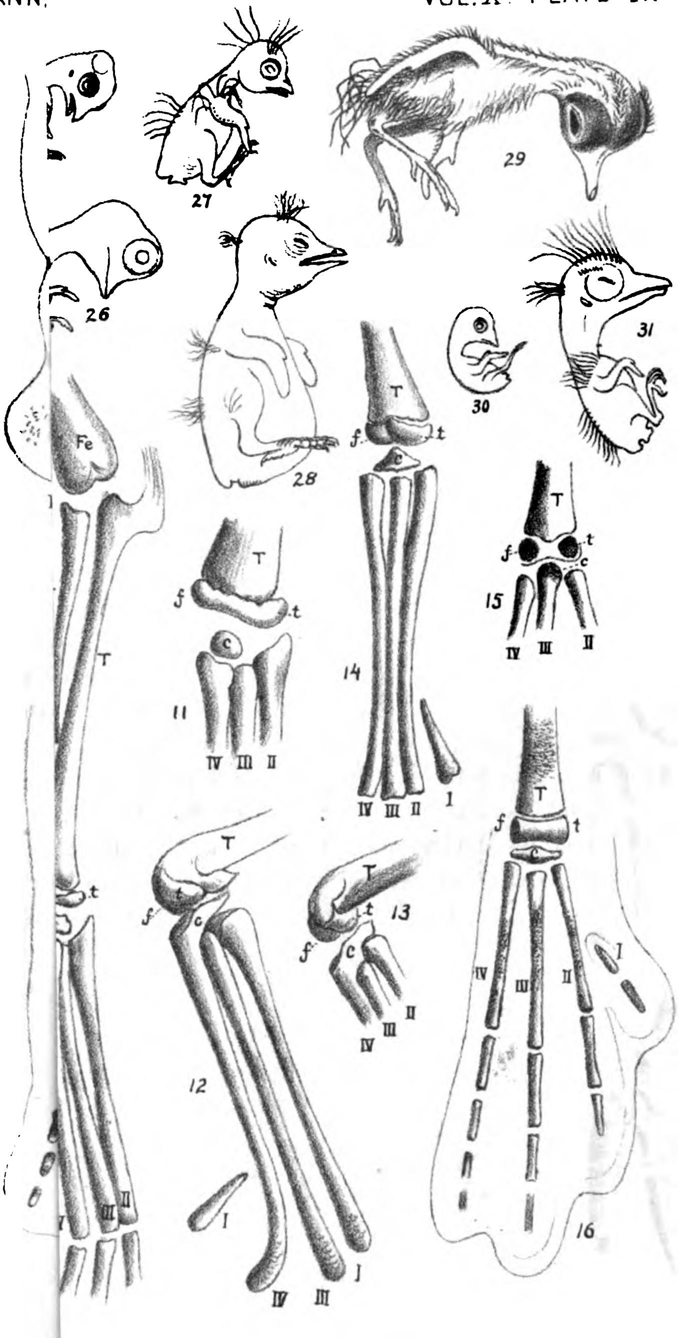
† Ann. Lyc. N. H. N. Y., viii, 420, 1867.

‡ Smith. Inst. Misc. Coll. Prime, Monog. Corb. 21, 1865.

M. Crosse wrote me that to make the information the more authentic he had consulted M. Deshayes, who had been one of the contributors to the Encyclopédie Méthodique. M. Deshayes sent him the following, which I have translated.

"We owe to Bruguière all the plates of Natural History "of the Encyclopédie Méthodique relating to the *Vers*, "except the last hundred for which we are indebted to Lamarck. The names of the genera printed at the top of the "plates are the only indications which exist relating to these "useful creations, which the author would have placed on "record in text, had not a premature death prevented him "from so doing. With reference to the existing text, Bruguière published one volume, which ends with the genus "*Conus*. It was in 1828 that I was entrusted with the finishing of this text; my first volume commences with a supplement to the letters a, b, c; it was published in 1830; "my second volume is of 1832; so that the text of the "Encyclopédie Méthodique" concerning Mollusca is composed of three volumes, one by Bruguière and two by me." (Extract from a letter addressed to M. H. Crosse by M. Deshayes, Nov. 24th, 1869.)

I.



NES OF BIRDS

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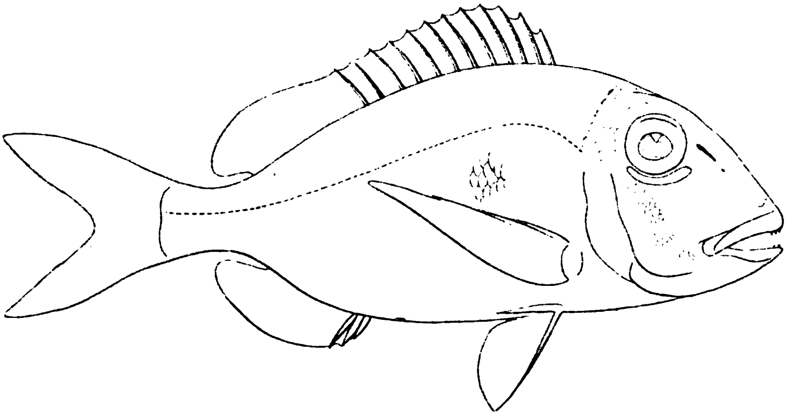
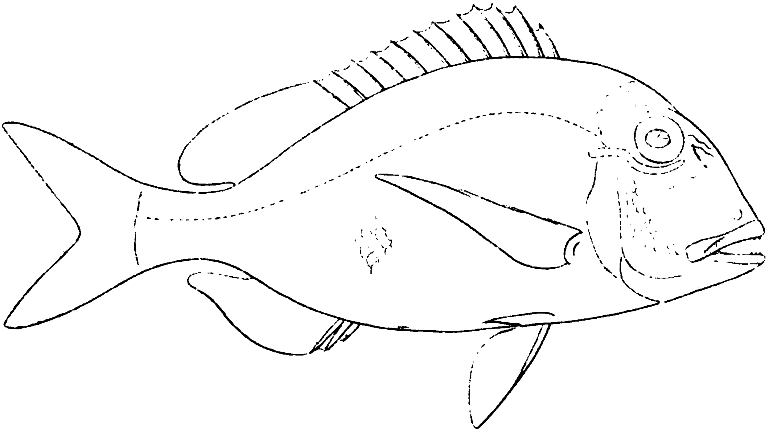


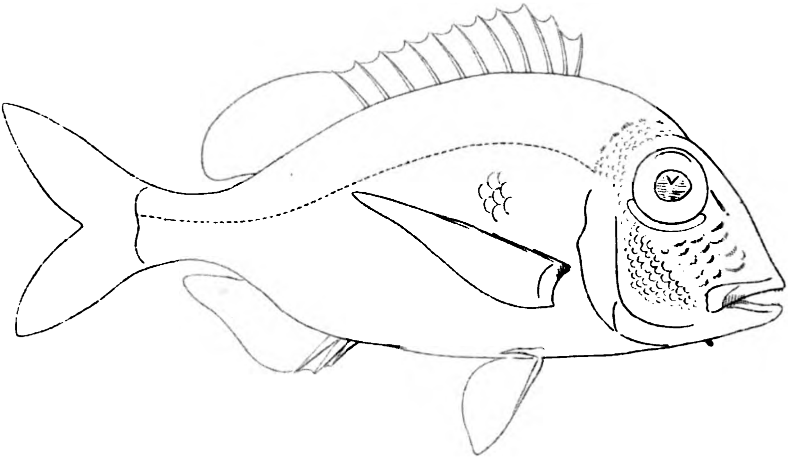
1. CALAMUS BAJONADO, *ex Bloch*.

½ Mag. Nat.



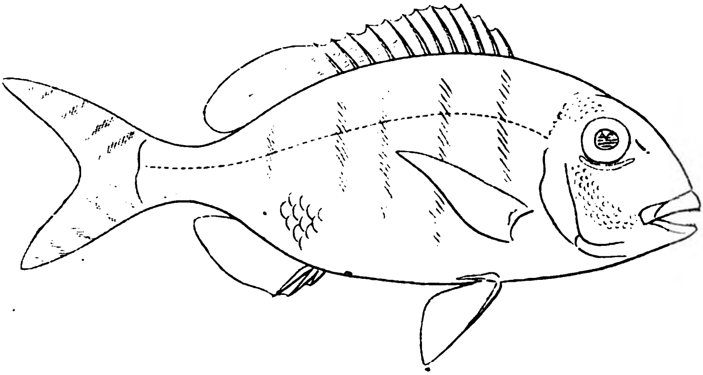
2. CALAMUS ORBITARIUS, *Poey*.

⅓ Mag. Nat.



3. **Calamus Macrops**. *Poey*.

½ Mag. Nat.



4. **Grammateus Medius**. *Poey*.

½ Mag. Nat.

PUBLICATIONS

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THOMAS BLAND,
Chairman of the Publication Committee.

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1874 Jan. 30

CONTENTS.

XIV.—Note sur l'Anatomie des Cyrènes Américaines. Par Dr. P. Fischer. (With plate VIII.) 191

XV.—On the Relations of Certain Genera of Terrestrial Mollusca of, or related to, the Sub-family Succininæ, with notes on the Lingual Dentition of Succinea appendiculata Pfr. By Thomas Bland and W. G. Binney. (With plate IX.) 198

XVI.—Description of Hemphillia, a New Genus of Terrestrial Mollusks. By Thomas Bland and W. G. Binney. . 208

XVII.—Essay upon a Necessary Limitation of the Unity of the General Forces of Nature. By Professor Benjamin N. Martin. 211

XVIII.—Description of a Species of Cervus. By W. J. Hays. (With plate X.) 218

XIX.—On the Lingual Dentition of Certain Terrestrial Palmonata Foreign to the United States. By Thomas Bland and W. G. Binney. 219

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XIV. — *Note sur l'Anatomie des Cyrènes Américaines.*

PAR DR. P. FISCHER
DE PARIS,
MEMBRE CORRESPONDANT DU LYCÉE D'HISTOIRE NATURELLE DE NEW YORK.

Read May 6th, 1872.

MR. Temple Prime de New York m'a adressé une certaine quantité d'animaux de Cyrènes appartenant à deux espèces qui représentent les types les plus tranchés des Cyrènes Américaines: *Cyrena Carolinensis*, Lamarck, et *Cyrena Floridana*, Conrad.

Il était important d'examiner ces Mollusques, qui paraissent s'éloigner sensiblement des Cyrènes de l'Ancien Continent et de celles de l'Océanie.

Les Cyrènes Américaines du groupe de la *Cyrena Carolinensis*, présentent un caractère très remarquable ; l'impression palléale forme un sinus étroit et allongé; ce caractère les distingue, à première vue, des autres Cyrènes, où le sinus palléal est rudimentaire. La *Cyrena Floridana* peut être considérée comme le type des espèces saumâtres, rostrées, minces, dont le sinus à peine indiqué rentre dans le cas général.

L'animal des Cyrènes est peu connu. Mr. Gray a donné les caractères de celui des *Batissa;*[*] j'ai pu moi-même décrire celui des *Corbicula*,[†] mais les autres groupes étaient restés inconnus jusqu'à présent, au point de vue de l'anatomie. C'est donc grace aux envois de Mr. Prime, que l'on peut aujourd'hui combler une partie de cette lacune.

Cyrena Carolinensis. Mollusque globuleux, à manteau assez mince, ouvert depuis le muscle adducteur antérieur jusqu'au dessous du muscle adducteur postérieur, où une cloison réunit les deux feuillets, pour constituer en arrière la cavité des siphons, assez petite d'ailleurs, par suite du faible développement de ceux-ci.

---

[*] Brit. Mus. Cat. Conchif., p. 234, 1854.

[†] J. Conchyl., XI, p. 5. Ann. Lyc. N. H., N. Y., VIII, p. 422, 1867.

Les bords du manteau sont minces, simples; en dedans un repli porte de très petits tentacules à peine visibles à la loupe. En haut le manteau constitue une crête s'insinuant dans la charnière et percée de trous qui correspondent aux dents cardinales, et qui reproduisent leur forme.

Le muscle adducteur antérieur des valves est semi-lunaire; l'adducteur postérieur est ovoïde et surmonté par un faible rétracteur du pied, laissant une empreinte peu profonde sur la coquille.

Le muscle palléal est assez large, mais ses fibres sont peu denses et rayonnent en faisceaux plus ou moins espacés. Vers le bord inférieur de l'adducteur postérieur on voit se détacher les fibres du rétracteur de l'arrière-cavité des siphons. Ces fibres forment deux faisceaux distincts : l'un inférieur, se portant jusqu'à la base de la cavité des siphons; l'autre supérieur, rayonnant en éventail et remontant vers le haut du bord postérieur de l'adducteur postérieur des valves.

Le muscle rétracteur des siphons, quoique allongé, est remarquablement étroit; sa direction est presque horizontale. Il se compose de cinq ou six trousseaux de fibres minces et aplaties. Sa longueur et son étroitesse le distinguent des muscles analogues chez les autres Cyrènes, qui sont toujours extrêmement courts, et de ceux des Galatées qui sont très larges et bien développés.

Les siphons petits, étroits, sont désunis dans leur longueur; le siphon supérieur ou anal est plus étroit et plus conique que l'inférieur; son extrémité libre ne porte pas de tubercules bien évidents. Le siphon branchial, au contraire, est pourvu d'une couronne de tentacules peu nombreux et cylindriques. Il serait à désirer que l'on put dessiner ces siphons durant la vie de l'animal et au moment de leur épanouissement; ils doivent alors dépasser sensiblement le bord postérieur de la coquille. Ils sont relativement plus longs mais aussi plus étroits, que ceux des *Corbicula* dont la saillie est à peine appréciable. Dans l'alcool ils sont musculeux, rigides et de coloration plus foncée que celle du manteau.

Les palpes labiaux petits, triangulaires, à base peu large, portent des sillons rapprochés sur les deux faces qui sont en contact, c'est à dire, sur la face interne du palpe externe et sur la face externe du palpe interne; les sillons des palpes sont beaucoup plus gros que ceux des branchies.

Les branchies sont larges et bien développées; la branchie interne dépasse l'externe en avant du tiers de sa largeur; elle se soude à la masse viscerale sur une ligne oblique d'avant en arrière et de haut en bas. La branchie externe est attachée à la même ligne d'insertion oblique que l'interne, mais non par son bord postérieur. En effet, cette branchie est divisée par la ligne d'insertion en deux parties dont l'antérieure est plus grande que la postérieure; il s'en suit que la branchie externe est libre dans presque toute sa périphérie et qu'elle ressemble aux deux feuillets d'un livre ouvert; le dos du livre représentant la ligne d'insertion.

La disposition des branchies est identique chez les *Galatea*, *Corbicula;* chez ces divers Mollusques les branchies semblent être au nombre de trois de chaque coté, si l'on considère comme une branchie distincte la portion postérieure ou réfléchie de la branchie externe.

La structure des branchies des Cyrènes montre qu'elles sont composées de tubes d'une finesse extrême, dirigés de haut en bas et d'arrière en avant, croisés par des tubercules perpendiculaires, qui circonscrivent des espaces rectangulaires très allongés. Ces tubes forment des stries visibles seulement à un fort grossissement; mais en outre les branchies portent des plis assez régulièrement espacés, dirigés aussi d'arrière en avant, assez gros, et qui donnent à la branchie l'aspect d'un grossier plissement régulier. Ce sont ces mêmes plis qui forment les fortes stries des branchies de *Corbicula.*

En arrière du pied et au niveau de l'orifice interne du siphon branchial, les extrémités des quatre feuillets branchiaux se soudent entr'eux. C'est dans l'espace compris entre leur point de jonction et leur insertion sur la masse abdominale que passe le muscle rétracteur du pied.

Le pied est allongé, peu élevé, tranchant; il ressemble à celui des *Corbicula.* La masse abdominale est peu développée; mais cette disposition provient sans doute de la rétraction alcoolique et de la vacuité des ovaires.

Le ganglion branchial est semblable à celui des *Galatea* par sa forme et le nombre des nerfs qui en partent et y aboutissent.

Cyrena Floridana. Les Cyrènes de ce groupe sont rostrées, triangulaires. Le manteau est mince; le muscle palléal étroit est très rapproché du bord de la coquille; il ne forme qu'un sinus très court au dessous du muscle adducteur postérieur des valves, mais ce sinus est cependant plus prononcé que chez les *Batissa* et les *Corbicula.* Le manteau est garni en dedans d'une rangée de petits tubercules placés au dessus du bord libre, qui est simple et mince.

L'impression musculaire de l'adducteur antérieur des valves a la forme d'un croissant, elle est étroite, l'impression de l'adducteur postérieur est ovale; l'impression du rétracteur du pied se voit à peine.

L'arrière-cavité des siphons, très étroite, montre deux siphons extrêmement courts; le siphon anal est large et cylindrique; le siphon branchial conique, un peu plus allongé, porte une couronne de petits tentacules. Ces siphons quoique peu développés sont désunis.

Les branchies dont la structure intime est semblable à celle des Cyrènes du groupe précédent sont disposées aussi de la même façon; mais la branchie interne est rèlativement plus grande; elle est double en longueur de la branchie externe. Celle-ci est divisée à peu près vers sa moitié par la ligne d'insertion sur la masse viscérale. La branchie externe est donc ovale, divisée obliquement en deux portions, dont la postérieure et supérieure est réfléchie.

Vers la partie postérieure du pied, les feuillets branchiaux se soudent entr'eux en embrassant le rétracteur du pied. Celui-ci est allongé, sécuriforme, court; son extrémité antérieure s'approche très près du muscle adducteur antérieur. Masse abdominale peu élevée. Palpes labiaux courts et triangulaires.

Conclusions. Si l'on résume ce qui est relatif au groupe des Cyrènes, on s'aperçoit que depuis les *Galatea* jusqu'aux *Batissa*, le muscle rétracteur du siphon diminue progressivement dans l'ordre suivant:

a. Muscle rétracteur des siphons long et large; siphons longs et larges. *Galatea.*

b. Muscle rétracteur long et étroit; siphons assez courts et étroits. *Cyrena Carolinensis.*

c. Muscle rétracteur court et triangulaire; siphons courts et étroits. *Cyrena Floridana.*

d. Muscle rétracteur extrêmement court; siphons larges et courts. *Corbicula.*

e. Muscle rétracteur non dévéloppé; siphons très courts. *Batissa.*

Ces diverses sections du groupe des Cyrènes sont géographiquement distribuées:

a. Les *Galatea* appartiennent uniquement au continent Africain. Pas de fossiles.

b. Les Cyrènes de la deuxième section, pour lesquelles nous proposons le nom générique de *Leptosiphon*, sont propres à l'Amérique du Nord. Nous ne les connaissons pas à l'état fossile, du moins dans les terrains tertiaires de l'Ancien Continent, mais il est probable qu'on en trouvera quelques espèces dans les couches du même age du Nouveau Continent.

c. Les Cyrènes de la troisième section, que nous nommerons *Cyrenocapsa*, sont propres à l'Amérique, où elles vivent dans les eaux saumâtres. Un certain nombre de Cyrènes éocènes leur seront peut-être rattachées.

d. Les Cyrènes de la quatrième section, ou *Corbicula*, ont une distribution géographique des plus étendues. On les a signalées dans toutes les parties du monde, excepté en Europe, mais là leur extinction est bien récente, puisque l'une d'elles, *C. consobrina*, existe dans les dépôts quaternaires de l'Angleterre, de la France et de la Sicile. Le type apparaît dans le Wealdien.

Les *Corbicula* du Continent Américain sont remarquables par la présence d'un sinus palléal évident.

e. Les *Batissa* sont reparties dans la plupart des îles de l'Océanie. On les trouve à l'état fossile à partir de l'éocène. Les *Velorita* ont une distribution géographique analogue.

Quant à la composition de la famille des *Cycladea*, Férussac, *Corbiculadæ* ou *Cyrenidæ*, Gray, *Cyclasidæ*, d'Orbigny, *Conques fluviatiles* de Lamarck, nous croyons qu'elle doit être ainsi établie :

1. *Cyrena*, Lamarck.
   Sous-genres ;
   - *Leptosiphon*,
   - *Cyrenocapsa*,
   - *Batissa*,
   - *Velorita*.
2. *Corbicula*, Megerle.
3. *Cyclas*, Bruguière.
4. *Pisidium*, Pfeiffer.
5. *Galatea*, Bruguière.

Peut-être le genre *Fischeria*, Bernardi, appartient-il à ce groupe, mais l'amplitude du sinus palléal et les caractères de la charnière le rapprochent beaucoup des *Iphigenia*. Il serait utile d'examiner l'animal pour être éclairé sur se
affinités.

Woodward place les *Cyrenella* parmi les *Cycla*
rapprochement me semble fautif; les *Cyre*
rapport qu'avec les *Diplodonta* et les *Ung*
constituer une petite famille, celle des
distincte par la structure de leurs branch

Le plus ou moins grand développement des siphons n'est pas, à mes yeux, un caractère de famille, et pour cette raison je place les *Galatea* parmi les *Cycladea* et non parmi les *Tellinidœ* comme le font Adams, Gray, Woodward, etc. Il faut n'avoir jamais vu un animal de *Tellina* pour proposer une pareille classification. Tout au plus pourrait-on rapprocher les *Galatea* des *Donacidœ*.

Cette famille des *Tellinidœ*, telle qu'elle est circonscrite par Adams et Woodward, est inadmissible. Les seuls genres voisins des *Tellina* par leur organisation anatomique sont les *Fragilia*, *Amphidesma*, *Scrobicularia*, *Syndesmya*. Les *Capsula*, *Psammobia*, *Sanguinolaria* forment une famille distincte ; les *Donax*, *Mesodesma*, *Iphigenia* constituent une autre famille.

EXPLICATION DES FIGURES.

Pl. VIII.

Fig. 1. Animal de *Cyrena Carolinensis*.

a, manteau ; *b*, expansion du manteau qui s'insinue entre les dents cardinales ; *c*, muscle adducteur antérieur des valves ; *d*, muscle adducteur postérieur des valves ; *e*, muscle rétracteur du pied ; *f*, muscle palléal ; *g*, muscle rétracteur des siphons.

Fig. 2. Le même.

Le manteau est enlevé en partie. Mêmes lettres. *h*, palpes labiaux ; *i*, branchie interne ; *k*, branchie externe ; *l*, portion réfléchie de la branchie externe ; *m*, pied.

Fig. 3. Portion du même pour montrer les siphons.

n, siphon anal ; *o*, siphon branchial ; *p*, cavité des siphons.

Fig. 4. Le même.

Les branchies sont relevées pour montrer le pied. *m*, pied ; *n*, masse abdominale.

Fig. 5. Animal du *Cyrena Floridana*.

a, manteau ; *c*, adducteur antérieur des valves ; *d*, adducteur postérieur des valves ; *e*, rétracteur du pied ; *f*, muscle palléal ; *g*, rétracteur des siphons.

Fig. 6. Le même.

Le manteau est enlevé. Mêmes lettres. *h*, palpes labiaux ; *i*, branchie interne ; *k*, branchie externe ; *l*, sa portion réfléchie ; *m*, pied ; *n*, siphon anal ; *o*, siphon branchial.

XV.— *On the Relations of Certain Genera of Terrestrial Mollusca of, or related to, the Sub-family Succininæ, with Notes on the Lingual Dentition of Succinea appendiculata Pfr.*

BY THOMAS BLAND AND W. G. BINNEY.

Read October 7, 1872.

THE receipt from Governor Rawson of specimens preserved in alcohol of *Succinea appendiculata* and *Omalonyx unguis* Fér, collected in and sent to him from Guadeloupe, by M. Schramm, has afforded us the opportunity of studying their dentition and induced us to examine the relations of certain genera which have been placed in the sub-family *Succininæ.*

Albers (2nd ed.) in group E, *Succinea*, has the following genera, viz., *Simpulopsis* Beck, and *Succinea* Drap., the latter divided into four sections, viz., *Amphibulima*, *Succinea*, *Brachyspira* and *Omalonyx.* He describes the jaw and refers to the lingual teeth in the following terms:—

Jaw arcuate, its convex margin extended into an almost quadrate plate; its concave margin striate or ribbed, with a short middle projection. Teeth of the lingual membrane as previously described (*i. e.*, tricuspid or bicuspid as in *Helicea*, etc.).

Simpulopsis Beck.

Beck (Index, p. 100) adopted this genus, but by name only. Shuttleworth (Bern. Mitt., 1854, p. 55) thus characterizes the animal:—

> "Animal heliciforme, testa omnino inclusum, pede lato subtus transverse plicato: pallium exappendiculatum.
>
> "Maxilla fere formam ferri equini habet, utroque latere dilatato-rotundato, medio autem angustata, costis 12 validis permunita, quarum 6 approximatæ in parte angusta mediana, et in utroque latere 3 majores, magis remotæ. Papillæ in laminam lingualem in seriebus obliquis ordi-

natæ, numerosæ; centralis tridenticulata, denticulo medio elongata; mediæ bidenticulatæ, denticulo interno elongato, externo brevi; marginales latiores inæqualiter tridenticulatæ, denticulis versus marginem exteriorem gradatim minoribus, interno autem valde producto.

"Genus naturale, *Vitrinæ* nullo modo affine, sed *Succineæ* proximum. Lamina lingualis autem diversa videtur (*Cf.* Phil. Handb., p. 243) atque etiam Maxilla (*Cf.* Terr. Moll. U. S., I, p. 213, pl. xiii, fig. 3)."

Heynemann (Mal. Blatt., 1868, p. 110, taf. v, f. 10) has description and figures of the teeth of *Simpulopsis sulculosa* Fér., mentioning that the jaw was not observed. On the accompanying plate we have given (Pl. ix, figs. 7, 8) copies of several of Heynemann's figures of the teeth, as many of our readers may not have access to the originals, and in a subsequent part of this paper we have described them.

With respect to the jaw not having been examined by him, Heynemann refers to that fact as rendering the correct classification of the genus difficult, but remarks that the form of the lingual teeth suggests relationship to the *Orthalicea*[*] rather than to the *Succinea*, as shown by a comparison of the marginals with those of *B. auris leporis* and *papyraceus*.

H. and A. Adams (Genera, II, 127) adopt in *Succininæ* the following genera:— *Simpulopsis*, *Succinea*, *Amphibulima*, *Helisiga* and *Omalonyx*, enumerating as species of the latter, *O. unguis*, *appendiculata* and *depressa*.

On reference to our subjoined notes on the so-called *Succinea appendiculata* from Guadeloupe, it will be observed that the form of its teeth agrees generally with that ascribed by Heynemann to *Simpulopsis sulculosa*, while his suggestions as to the affinities of the latter genus (the jaw being unknown to him) are supported by our discovery of the character of the jaw in the Guadeloupe species. It must not, however, be overlooked that while the animal of *Simpulopsis* is entirely covered by the shell, that of the *S. appendiculata* under consideration is limaciform, like

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[*] It must be remembered that we use the term *Orthalicinæ* in a much more restricted sense than the *Orthaliceæ* of Albers and von Martens. See our notes on Systematic Arrangement, Ann. N. Y. Lyc., x, p. 168.

O. unguis, as figured by Orbigny (Voy., t. 22, f. 1–7). With the form of jaw described by Shuttleworth and the quadrate marginal teeth, it would seem that *Simpulopsis* belongs to the *Helicinæ* and not to the *Succininæ*. It may be noticed that, even form of shell alone considered, some of the species might appropriately be placed near to *Bulimulus*.

Guppy (Ann. and Mag. Nat. Hist., Jan., 1866) described *S. corrugatus*,* from Trinidad. Of the animal he says, "mantle edge narrowly reflexed over the peristome." Subsequently, the same author (Amer. Jour. of Conch., VI, 308, 1871) mentions having ascertained, from a young example of *S. corrugatus*, the characters of the dentition of *Simpulopsis*, and that it resembles that of *Succinea* more than he had anticipated. He says, "the odontophore is moderately large, but the individual teeth are very minute and resemble those of *Succinea*, particularly, perhaps, *S. ovalis*."

It seems to us that one important characteristic of the dentition of *Succinea*, absent in that of *Simpulopsis*, is the gap or notch in (as if by the cutting away of) the lower edge of the base of attachment in the central, and corresponding gap in the inner edge of the laterals.

Fischer and Crosse, in 1867, established the genus *Xanthonyx* (Jour. Conch., 1867, p. 221, et seq., pl. x, figs. 1–4), describing as the type *Vitrina Sumichrasti* Brot (*l. c.*, p. 70, pl. iv, fig. 2), and referred to the same genus *Simpulopsis Salleana*, *S. Cordovana* and (with some doubt) *S. Chiapensis*.

Among the generic characters of the animal of *Xanthonyx*, derived from examination of a specimen of *X. Sumichrasti*, communicated by Brot, are the following, "Animal testa sua multo majus, haud omnino inclusum," and "maxilla arcuata, costata; tæniola lingualis dentibus basi subquadratis, inæqualiter bicuspidatis (dente medio tricuspidato) instructa."*

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* Guppy compares his species with *S. Brasiliensis* (Syn. of *S. obtusa* Sow.), from which indeed it seems scarcely distinguishable.

With respect to *X. Salleanus* and *Cordovanus*, the authors state, on the authority of Sallé, that the animals are much larger than their shells, as in *X. Sumichrasti*.

Xanthonyx, as well as *Simpulopsis*, belongs to *Helicinæ* and not to *Succininæ*.

Succinea DRAP.

Amphibulima.—Albers (*l. c.*, 309) gives as the type of this section of *Succinea*, *A. patula* Brug., but without any special description of animal or its dentition.

Guppy (Ann. and Mag. Nat. Hist., June, 1868) mentions the occurrence in Dominica of *A. patula*, and we were indebted to him for the lingual membrane (without jaw), of which we published figure and description in Amer. Jour. Conch. VII, 186 (1871), pl. xvii, fig. 1–2. Guppy does not particularly notice the animal, and we assume in consequence that, as in *Succinea* s. s., it is capable of retraction within the shell; indeed the form and character of the shell preclude any other supposition.

Guppy (*l. c.*, June, 1868) describes another species, found by him in Dominica, as *Amphibulima pardalina*, the animal of which he describes as follows:—

"The animal resembles that of *Omalonyx unguis* Fér. (D'Orb. Voy. Amer. Mer. pl. xxii, fig. 1–7). The foot is translucent, like a bit of ice dipped in milk, the internal organs showing as a dark, variegated patch about the shell, into which the body is incapable of retraction."

Guppy adds (and apparently he was acquainted with the dentition [not the jaw], of *A. patula* only):

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*Fischer and Crosse (Études sur les Moll. Terr. et Fluv. du Mexique et du Guatemala, 192–199, pl. 9, figs. 14–17) give a more detailed description of *Xanthonyx*, and remark on certain of its affinities with the genus *Binneya*. The part of the work referred to reached us after our manuscript was in the printer's hands.

"Forming my judgment from the soft parts and the lingual dentition, I should separate *Amphibulima* as a genus from *Succinea*. The genus *Amphibulima* might then be divided into the following groups:—

Amphibulima s. strict.	Type *A. patula*.
Omalonyx D'Orb.	" *O. unguis*.
Brachyspira Pfr.	" *A. pardalina* and *tigrina*."

Without knowledge of the jaw of *Amphibulima*, and we scarcely think that the genus can be elasmognathous, we are unable to decide whether it belongs to *Succininæ* or not, but have a strong impression that its proper position is in *Helicinæ*.

The dentition of *Amphibulima*, as shown in our figure, does not materially differ from the form usual in the *Helicidæ*, excepting in the marginal teeth, which are very long and narrow. The cutting away of the plate, before referred to as characteristic of *Succinea*, is entirely wanting in *Amphibulima*.

v. Martens (Zool. Record, 1868, p. 491) observes that "Mr. Guppy reëstablishes *Amphibulima* as a genus distinct from *Succinea* (Drap.) on account of its different lingual dentition, but without pointing out the difference."

Succinea s. strict.—The animal, lingual dentition and form of jaw need no special notice in the present paper. We would express, however, the opinion that those species only, to whatever group or section they belong, which are elasmognathous, should be admitted in *Succininæ*.

There are several elasmognathous genera with animals of varied forms on which we have no occasion here to remark.

Brachyspira Pfr.—This group is based on the form of shell, and it is worthy of notice that Albers (ed. 2) gives as the type *S. tigrina* Lesueur, which is very near to, if not identical with, as Guppy remarks, his *A. pardalina*. If the animal of the latter be as described by Guppy, we certainly should not place the species in *Brachyspira*, which belongs rather to *Succinea* than to *Amphibulima*.

Tryon (Amer. Jour. Conch., II, 236–241, 1866) refers many species of North American *Succinea*, we think erroneously, to *Brachyspira*. In *Land and Fresh Water Shells of North America* (1869) we adopted the latter in the sense in which it is used by Albers (ed. 2).

Omalonyx D'Orb.

Albers (*l. c.*, 311) refers to *O. unguis* Fér. as the type of this group. D'Orbigny (Voy., 229, t. 22, figs. 1–7) gives the following description of the animal:

> "Allongé, ovale, déprimé, beaucoup trop grand pour rentrer dans la coquille, occupant près de trois fois la surface de celle-ci; pied très large débordant de toutes parts, arrondi en avant, acuminé postérieurement, lisse en dessous et en dessus; manteau formant un bourrelet autour de la coquille, qu'il recouvre sur les bords, étroit en arrière, plus large et comme plissé en avant; col assez long; tête étroite; tentacules courts; orifice des poumons sous le bord droit du manteau, vers sa partie moyenne."

Fischer (Mélang. Conch., p. 67, pl. vi, f.1) describes the animal of *O. unguis* and its dentition.

Sometime since we were indebted to Mr. John G. Anthony for specimens collected by him (Agassiz' expedition) in Brazil, and found, on examination of the jaw and lingual dentition, that both agree with the figures given by Heynemann (Mal. Blatt., 1868, taf. iv, fig. 5) of the jaw and teeth of *Pellicula convexa* Martens, of which figures we add copies (plate ix, figs. 12–14).

As already mentioned, we have lately received from Governor Rawson specimens in alcohol of animal and shell of *O. unguis*, collected in Guadeloupe by Schramm, and find that both jaw and teeth are precisely similar to those of the Brazilian examples.

It appears, irrespective of form of animal and shell, that should even *Amphibulima* prove like *Omalonyx* to be elasmognathous, the lingual dentition of the latter does not warrant its being treated, as proposed by Guppy, as a section of the former genus.

Guppy has lately discovered in Trinidad, but not yet, we believe, described, another species of *Omalonyx*, the shell of which he has communicated to Governor Rawson, with the name *Amphibulima* (*Omalonyx*) *felina*. Indebted to Mr. Rawson for an opportunity of examining the shell, we find, as the author remarks in a letter accompanying the specimens, no appreciable distinction between it and the Guadeloupe *O. unguis*.

In a late letter Mr. Guppy states that "the animal of *O. felina* resembles in general character *O. unguis*, *O. pardalina* and *A. patula*, the latter being much larger, darker, more strongly colored and more coarsely striated."

The Guadeloupe specimens received from Gov. Rawson, collected and labelled by Schramm *Succinea appendiculata*, are extremely interesting and not a little perplexing, indeed Schramm, judging from his notes sent with them, rather suggests that *S. appendiculata*, *depressa* and *O. unguis* are all one and the same species.

Succinea depressa Rang (Guer. Mag., 1834, t. 55) is a species as to which there seems to be much uncertainty. Fischer described it, the animal and its dentition, as *Pellicula depressa* in Act. Soc. Linn. Bord. XX, 5, to which we have not had an opportunity of referring, and also in Mélang. Conch. p. 67, t. vi, f. 19.

In the latter work, the jaw and teeth are thus characterized :—

"Mâchoire semblable à celle des Limaces, et portant une quantité de denticulations. Plaque linguale se rapprochant de celles des Ambrettes. Epines médianes trifides; latérales bifides."

We give copy of the figure of the jaw on plate ix, fig. 4.

Petit (Jour. Conch., 1856, p. 154) expresses the opinion that *S. appendiculata* Pfr. is the same species, Rang's specific name having priority, but Pfeiffer (Mon., IV, 804) referring to Rang's figure, maintains that they are distinct.

The character from which the specific name of Pfeiffer's species is derived, he describes (Mon., II, 531) thus; "columella callosa, aperta, appendicula dilatata, torta superne munita," adding in a footnote, "Forma persimilis præcedenti (*S. depressa* Rang), at bene distincta columella appendice torta quasi duplicata, spira subpapillatim prominula et peripheria magis regulari." This appendage is shown in our figure (pl. ix, fig. 6) of Rawson's *appendiculata.*

v. Martens (Malak. Blatt., 1868, p. 183) described *Succinea* (*Pellicula*) *convexa,* to the dentition of which by Heynemann we have already referred, giving also (plate ix, figs. 12–14) copies of his figures.* One of the characters of this species is said to be by its author, "paries aperturalis appendicula parva, plicæ-formi munitus."

With respect to the validity of his species, v. Martens adds a note to the following effect,—*S. depressa* Rang, as its name implies, differs from our species by being less arched. Pfeiffer writes that *P. convexa* is by no means the same as his *S. appendiculata.* If the latter be identical with *depressa* as Fischer maintains, then Rang's figure is entirely faulty, the most essential character, the process on the columella, being overlooked.

A comparison of the figures presented on plate ix, will show that the *Pellicula depressa* of Fischer has a ribbed jaw (fig. 4), and does not belong to the *Succininæ*,† while *Pellicula convexa* v. Martens is elasmognathous, like *Succinea* (fig. 14).

It seems to us that *S. depressa* of Fischer must be treated as the type of *Pellicula,* while *S. convexa* belongs to *Omalonyx.*

Albers (ed. 2) does not include in *Omalonyx* or other group *S. depressa* or *S. appendiculata,* mentioning them only in a remark of the following purport:—

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*v. Martens (Zool. Record, 1868, p. 492), referring to Heynemann's figure, says "proving that *Pellicula* is not generically distinct from *Succinea.*"—a proposition in which we do not concur. H. & A. Adams (Genera, II, 568) inconsiderately remark that *Pellicula* Fischer is syn. of *Helisiga,* and founded upon *H. depressa* Fischer, a new species of that genus.

† Mörch (Jour. Conch. 1865, p. 381) places *Pellicula* in his section *Odontognatha.*

Succinea appendiculata, identical with *S. depressa* Rang, is made by Fischer the type of a separate genus, *Pellicula*, after an examination of the jaw, lingual dentition and generative organs; Albers (*l. c.*) adds that he had not yet been able to decide upon the correctness of those views.

From the subjoined diagnosis of the species received as *Succinea appendiculata* from Guadeloupe, it will be seen that the animal is limaciform, has a jaw, not as in *O. unguis*, but allied to that of genera and species of *Helicinæ*, and teeth agreeing somewhat closely with those of *Simpulopsis*. In pl. ix, we give figures of the animal (from an alcoholic specimen), of part of the jaw and teeth (Figs. 2, 9, 10, 11).

We now proceed to describe the jaw and lingual membrane of *Succinea appendiculata* Pfr., received from Governor Rawson:

Jaw extremely thin and transparent, long, low, slightly arcuate, ends blunt, divided longitudinally by about 40 delicate ribs into as many plate-like sections, of the character found in the jaws of *Cylindrella*, *Macroceramus* and many species of *Bulimulus*. No appearance of triangular upper median plates, however, as in *Cylindrella*, though the two specimens examined by us are not perfect at that part. Both margins serrated by the extremities of the ribs. The general character of these ribs is the same as in *Helix turbiniformis*, figured by us in Ann. of Lyc. of Nat. Hist. N. Y. x, pl. 2, fig. 2. The jaw is quite membranous.

Lingual membrane as usual in the *Helicinæ* proper (see Ann. Lyc. Nat. Hist. N. Y. x, 163). Centrals subquadrate with a very large, stout, short, pointed cusp, the side cusps obsolete. Laterals larger and more narrow than the centrals, bicuspid, the inner cusp greatly produced, broad and quite squarely terminating. The base of attachment of the laterals is cut away on the inner side, leaving a large outer lateral expansion, bringing to mind the much less developed one of *Succinea*. Marginal teeth quadrate, gradually becoming modified from the laterals, the cusps finally passing off into simple, obtuse papillæ, the inner one the larger.

The central and lateral teeth are like those of *Simpulopsis sulculosa* as figured by Heynemann in Malak. Blatt. xv, pl. 5, fig. 10, the central, however, bearing a much more developed cusp in our species. The marginals in that figure, of the form found in *Bulimulus aurisleporis*, *papyraceus*, *laticinctus*, etc., we failed to detect in our species. As already stated, we found the marginals merely a modification of the laterals.

The above description does not agree with that given by Dr. Fischer (Mélanges Conch., 69, t. vi, fig. 19) of *Pellicula* *depressa*, which we have already quoted. He describes the jaw as having a number of ribs on its anterior surface pectinating the cutting margin, actually nine of them being shown in his figure. He also describes the lingual dentition as quite different, the centrals being represented with one large bifid median cusp and one small cusp at either side. His figure of the lateral teeth is also simply bicuspid, the figure of the inner cusp does not show any trace of the peculiar prolongation and blunt termination, described by us above. For convenient reference we copy Fischer's figure of the jaw (Plate ix, fig. 4).

The external appearance of our animal is the same as described by Fischer in the paper referred to. Little confidence, however, can be placed on the external characters of the animals of this group, that of *O. unguis* being, as Fischer remarks, nearly the same as of the species under consideration.

As already mentioned, *P. convexa* v. Mart., from its form of jaw, cannot be placed in Fischer's genus *Pellicula*, while the *appendiculata* examined by us has jaw (as well as teeth) of different character from that assigned by Fischer to *Pellicula depressa*, but for the present we refer, with doubt, our species to *Pellicula;* most certainly it does not belong to *Succinea*.

We appear to be warranted in assuming that Mr. Rawson's *appendiculata* is Pfeiffer's species, specifically and probably generically distinct from *S. depressa* Fischer. Whether the latter is or is not the *S. depressa* Rang we are unable to decide.

XVI. —*Description of Hemphillia, a New Genus of Terrestrial Mollusks.*

BY THOMAS BLAND AND W. G. BINNEY.

Read October 7, 1872.

Hemphillia.

Animal limaciforme, parvum, antice obtusum, postice attenuatum. Pallium subcentrale, magnum, ovatum, antice valde productum, marginibus liberis. Discus gressorius distinctus nullus. Porus mucosus transversus in apice pedis, processu coniforme valido protectus. Apertura respiratoria ad dextram, in medio marginis inferioris pallii, genitalis ad basin tentaculi dextri oculigeri.

Testa externa, unguiformis, subquadrata, replicatura pallii marginorum breviter inclusa.

Maxilla et lamina lingualis ut in *Arione* constituta, dentes centrales tricuspidatæ, laterales bicuspidatæ, marginales quadratæ, bicuspidatæ, papillis internis valde productis, externis subobsoletis.

Animal limaciform, small, blunt in front, tapering behind. Mantle subcentral, large, oval, greatly produced in front, free around its margin and slightly reflected over the edges of the shell. No distinct locomotive disk to foot. Lines of furrows run near and parallel to edge of foot, rising above the extremity and apparently uniting over a transverse, mucus slit, overhanging which is a greatly produced horn-shaped process. Respiratory orifice at right edge of mantle, near its centre. Generative orifice at right side of neck, near right eye peduncle (Plate ix, figs. 1 and 3).

Shell external, its edges imbedded lightly in the mantle, very thin, unguiform, almost as large as the mantle (in specimens preserved in alcohol) (Plate ix, fig. 5).

Jaw wide, low, slightly arcuate; ends blunt, but little attenuated; anterior surface with numerous ribs denticulating either margin.

Lingual membrane as usual in the *Helicidæ*. Teeth in *Hemphillia glandulosa* about 23–1–23. Centrals and laterals long, the former tricuspid, the latter bicuspid; marginals about twelve, quadrate, the inner cusp long, narrow, oblique, bluntly pointed, outer cusp subobsolete (Plate ix, figs. 15–17).

Hemphillia glandulosa.

Animal, shell, jaw and lingual membrane as already described above under *Hemphillia*. (See Plate ix.)

Animal about 12 mill. long (preserved in alcohol); color smoky white, mottled with longitudinal, dark brown blotches, running obliquely from the edge of the mantle to the foot, uniformly with the coarse granulations, of which we counted about twenty-five on either side of the animal. Caudal process very large, triangular in profile, dark brown, with a few coarse granulations.

Shell unguiform, slightly convex, light horn-color, very thin, its edges almost membranous, with prominent concentric lines of growth; five mill. long, three wide.

Habitat.—Astoria, Oregon: Mr. Henry Hemphill.

Our description is drawn from specimens preserved in alcohol, due allowance for which fact must be made. They were collected at Astoria, Oregon, by Mr. Henry Hemphill, to whom we dedicate the genus in return for most valuable addition to our knowledge of the land shells of the Pacific region.

This curious slug, by its general outline and by the form and position of its shell, may be compared to *Omalonyx unguis* D'Orb, and the species known formerly as *Succinea appendiculata* Pfr., but now usually referred to *Pellicula*. The former has, however, a jaw with the supplementary extension as in *Succinea*, the latter has the jaw usual in *Bulimulus* and *Cylindrella*, while neither of them has the prolongation of the mantle. Both of those genera also are readily distinguished by their shell being more developed and approaching a spiral form.

Hyalimax is distinguished from *Hemphillia* by its Succinea-like jaw. Otherwise, it resembles our genus in its general outward appearance, and by its non-spiral shell. This shell, however, in *Hyalimax* is almost, if not completely, internal, while the shell of *Hemphillia* is entirely exposed.

Binneia, in its prolonged mantle and costate jaw, resembles *Hemphillia*, but its shell is much more developed, spiral, striate and almost capable of protecting, though not absolutely including, the animal when contracted.

Xanthonyx and *Simpulopsis* are both described with costate jaw, but they have both highly developed, decidedly spiral shells.

Finally, from all the above mentioned genera and from all known sublimaciform genera, our genus is at once distinguished by the peculiar hump-like process on the tail, reminding one of the caudal process in *Nanina*.

EXPLANATION OF PLATE IX.

Fig. 1. *Hemphillia glandulosa.*
The caudal extremity greatly enlarged.

Fig. 2. *Succinea appendiculata* Pfr.
From Governor Rawson; a portion of the jaw.

Fig. 3. Same as fig. 1, enlarged.
From a specimen preserved in alcohol.

Fig. 4. *Pellicula depressa* Rang.
The jaw; copied from Fischer, Mél. Conch., *l. c.*

Fig. 5. Same as fig. 1. The shell, enlarged.
Seen from above.

Fig. 6. *Succinea appendiculata* Pfr.
From Governor Rawson, slightly enlarged, the right hand figure showing profile of appendage.

Fig. 7. *Simpulopsis sulculosa* Fér.
A marginal tooth, copied from Heynemann, Mal. Blatt., 1868, pl. v, fig. 10.

Fig. 8. Same as fig. 7; centrals and laterals.

Fig. 9. *Succinea appendiculata* Pfr.
From Governor Rawson; centrals and laterals.

Fig. 10. The same; marginal tooth.

Fig. 11. The same; external view of animal contracted in alcohol.

Enlarged about one half.

Fig. 12. *Pellicula convexa* Martens.

Centrals and laterals; copied from Heynemann, *l. c.*, pl. iv, fig. 5.

Fig. 13. The same; marginal tooth.

Fig. 14. The same; jaw.

Fig. 15. *Hemphillia glandulosa.*

Extreme marginal teeth.

Fig. 16. The same; first marginal teeth.

Fig. 17. The same; central and lateral teeth.

XVII. — *Essay upon a Necessary Limitation of the Doctrine of the Unity of the General Forces of Nature.*

BY PROFESSOR BENJAMIN N. MARTIN,
of the University of the City of New York.

Read Nov. 6, 1872.

THE great and characteristic doctrine of our modern physics is that which affirms the unity and the convertibility of the forces of nature. Varied and multiform as are the diffused agencies of the physical universe, it is found that they are fundamentally ONE; and the proof of this oneness is furnished by the fact that they are all convertible into one another. On the one hand, electricity, magnetism and galvanism, — on the other, light and heat, may be made to produce each other. One of these forms of force can disappear only by giving birth to another; and the sum of them all is ever the same. Under certain conditions, galvanic electricity will manifest itself as light and heat, and heat will develop electricity again. Each is a form of motion convertible into the other. Moreover, they sustain a common relation to the motion of the masses of matter around us: each will produce such motion, and will be accurately and completely measured by the amount of motion into which it is thus capable of resolving itself.

This doctrine, of the unity of the general forces of nature, I do not propose to dispute. It is a doctrine of the most interesting and beautiful kind; and if not fully proved,—and some eminent physicists still demur to the reception of it—it yet furnishes so many singular and ingenious explanations of phenomena, that one is tempted to overlook its want of complete demonstration, and acquiesce, perhaps by anticipation, in the conclusion which affirms it. And yet there seems to be a limitation of its scope, arising out of the necessary relation of this to another equally important physical doctrine of our day—the indestructibility of matter.

It is affirmed with equal certainty that, in all the varied round of changes taking place among the particles and combinations of matter, no slightest atom or molecule of it is ever lost. Every chemical change is but a combination, or a resolution, of the particles of a mass; but these particles are ever the same in number, in weight, and in attraction. No one of them can by any possibility ever be put out of existence. The amount of matter is as constant as the amount of force in the universe; and both are alike beyond our power to alter or reduce.

It has not hitherto been observed, however, that the one of these doctrines imposes by necessity a limit upon the scope of the other; and it is with the object of calling attention to this restriction, that the present paper is offered. Before proceeding, however, to point out the limitation referred to, it may be well to endeavor to gain a more exact appreciation of the doctrine already described, of the convertibility of force. What is meant by it?

Strictly speaking, this view is often not accurately stated in the ordinary language of science. "Heat," according to Tyndall's just and happy statement of the fact, "is a mode of motion;" it is a motion of the molecules, instead of a mechanical motion of the mass as a whole. The one of these motions may be converted into the other. If a leaden bullet be dropped from a considerable height upon an iron plate which arrests and destroys its mechanical motion, the result is a quivering or vibrating of the particles in their molecular spaces, and this is first, heat; if carried farther, it may become light, or it may give rise to electricity, which again are only other forms of molecular agitation or disturbance; and either of these may, by cooling, which is but the arrest of the molecular agitation, occasion again the mechanical motion from which it originated.

Accurately conceived, then, all these phenomena are forms, not, as is so often stated, *of force*, but of motion. Heat is a mode of motion; light, too, is the vibration of the particles of the elastic medium which fills the inter-planetary spaces around our globe; it is another and more rapid vibration, propagating itself through the ether by undulations, in other words, it is another mode of motion. The phenomena of electricity, also, manifest themselves simply as attractions and repulsions,—that is, as motions of particles and masses of matter, to and from each other. In the same way, every other manifestation of these imponderable agents is simply, and only, a distinct and peculiar mode of molecular motion.

Now of all these phenomena, the universal law is that no one is fixed or permanent. Each is a transient modification of some other, or of that which is the common ground of them all. Each is called into existence by another; it comes to view solely by the disappearance of another. One is born because a previous phenomenon of the same kind ceases to exist; each dies in giving birth to its successor. This extinction, too, is absolute and inevitable. The amount of force involved in one of these changes is ever the same, but it cannot exist in two of these forms at the same time; the preceding form must cease to exist before that into which it is convertible can take its place. The mechanical motion of a body must utterly stop and cease, before the heat can be developed into which it is resolvable; and that cessation is absolute. So far as the conversion takes place, so far is the destruction of the previous form of motion utter and complete.

There is in this common relation of all these phenomena to motion, an obvious reason for their correlation with one another. They are phenomena of the same kind. All are simply forms of motion; and it is no great novelty to learn that one form of motion may be converted into another. The whole doctrine of the convertibility of the forces resolves itself into the very familiar fact of the communication of motion by impulse. Where one of two billiard balls impinges on another in the precise line of its direction, its motion is imparted to the other, and itself is arrested and stopped. So it is also with the atoms and masses of the physical world. The balls may differ in size, and in the precise mode of their motion, but these are the only differences. One imparts to another its motion; or a large mass communicates movement to a multitude of minute particles; in each case it has its own motion destroyed by the change; and this is the whole of it. The convertibility of the forces implies, then, nothing more than the communication of motion by impulse.

When, however, we examine the particles of matter for their essential characteristics, we find that something more than mobility enters into their nature. Adopting, with some variation of order, the accurate analysis of Sir William Hamilton, they may be grouped under the two general heads which follow. We may regard matter, first, as included in space, and secondly, as occupying space.

I. Under the first aspect, as included in space, it has *position* and *mobility*.

(1.) It is known in finite parts and forms; and these must be recognized as occupying definite places in space; matter, therefore, has (1) POSITION.

(2.) Next, it has *mobility*. In consequence of the relations of the parts of space to one another as absolutely adjacent, that which occupies one part of space may be shifted to another; in other words, it possesses (2) MOBILITY.

II. Under the second aspect, as occupying space, matter may be said to have (1) *Divisibility;* (2) *Magnitude;* (3) *Form;* (4) *Ultimate incompressibility*, or the impossibility of being compressed by pressure from an extended to an absolutely unextended thing, from what is, to what is not, extended.

Now, when these general properties of matter are examined, it is at once seen that no one of them, except the last, has any relation to force. Position, mobility, form, magnitude, these are not properties of force, nor do they result from force. They can all be conceived ideally. But incompressibility, however ultimate, has direct relation to a resisting force in the body itself. The atom in the last analysis is incompressible; it cannot be so compressed that it ceases to occupy space, and to repel other matter from the space which it fills. So far as there are pores or vacuities in any kind of matter, so far other matter may permeate a given mass, as the air permeates cork, or as one gas diffuses itself between the molecules of another. But the atom is ultimately incompressible, it resists all compression which would destroy its integrity. It evermore asserts its own existence, against every other particle with which it can come into contact.

In resisting compression, however, the atom manifests itself as possessing a true force; for resistance to our own voluntary motion is, in the last analysis, the only form in which any force manifests itself to us. Gravitation we know as a force, because it resists our own efforts to support a falling body. It is through the same means that we come to the knowledge of any other force. Cohesion is known to us as a force, only by its resistance to our endeavor to separate the parts of one united body, or mass.

There is, then, in every atom of matter a resistance to compression which is an essential property of matter itself. So far as we know, it does not impart motion to the atom at all, and has no relation either to motion, or to the space in which the atom moves. It simply attends the particle and occupies its internal mass. It is not called into operation by any motion, mechanical or molecular, into which the particle may be thrown. Moving, or at rest, the sole function which we can recognize in it, or as belonging to it, is to preserve the existence of the particle itself; and this it does so effectually that, as we have already seen, no particle is ever destroyed, and the sum of them in the universe has never, from the first, been diminished, by a single atom.

Now it is an essential characteristic of this force that it is, and must be, forever inconvertible into any other. For if the force which guards the integrity, and guarantees the permanent existence, of a particle, were convertible with any other, it could not in its converted form perform its original function; and the atom might be converted into light, or heat, or electricity. It might impart to other particles the undulation which constitutes light; but it could not do this, and continue to resist compression, to which all matter is perhaps subject. The atom would no longer be capable of asserting itself by its normal resistance to external pressure, and so, capable of maintaining its own existence; and might disappear forever in a flash of light. Matter deprived of the force by which it is ultimately incompressible, would no longer be indestructible; its preservative force would be gone; and matter without that preservative force which arises from this power of resistance, would be inconceivable. The fundamental fact or law of physics, that all matter is indestructible, implies that its essential force of resistance to compression is inconvertible with any other. It exists unchanged through all the chemical changes, through all the molecular vibrations, or undulations, through all the mechanical transfers, or movements of mass, which take place in the universe around us; and it is forever incapable of being converted into any one of these phenomena of motion. Being wholly internal, it is incapable of passing out into the spaces beyond the volume of the atom whose existence it preserves. It exists unchanged through motion and rest alike, and, possessing no relation to motion, is inconvertible into any form of it, either molecular or mechanical. Its sole function is to maintain the existence and reality of the atom which it permeates, as a permanent, indestructible and, therefore, inconvertible thing.

That form of force, then, which has for its exclusive function to guarantee the indestructibility of matter, must be conceived as *sui generis*,—as wholly peculiar, incommunicable to anything else, and inconvertible with any other form of force in the universe. We must, therefore, recognize the reality of one force, at least, which is incapable of transmutation into any other.

Moreover, this peculiar and inconvertible force is also incapable of correlation. It cannot be converted, either into any other force directly, or into that mechanical motion which is the common measure of all the others. We cannot express this resistance in terms of any other denomination. We cannot say that it is equivalent to a given amount of heat, nor can we assign the number of foot-pounds which will measure the ultimate resistance of an atom to compression. As destitute of all relation to motion, it is out of all relation to those forces which express and measure themselves by motion. It simply cannot take the form of light, or heat, or electricity; a greater degree of heat is as incapable of expressing the intensity of this force, as a less would be. It stands outside of the sphere within which the correlation of the forces finds its scope; and being necessarily out of *all* relation with the others, it is of course incapable of correlation with them.

It follows that the doctrine of the convertibility of the forces relates properly only to those general and diffused forces of nature which impart motion, and not, so to speak, to the private force of the individual particle; and that the modern doctrine can be true, only with this important limitation of its scope.

XVIII.—*Description of a Species of Cervus.* (*Plate* x.)

BY W. J. HAYS.

Read October 8, 1872.

Cervus Yucatanensis.

This beautiful deer is found throughout Yucatan and the southern part of Mexico, but little is known of its habits in its native place, and so far as I can learn no account of it has been published. Its color is a grayish-brown on the back and front of the legs, the sides more yellow and running into white on the belly, the color of the head and face similar to the autumn coat of the *Cervus Virginianus*, the legs a brownish-yellow, lighter on the inner side; the inner side of the thigh, and the under side of the tail, as well as the inside of the ear, are white; the chin and under side of the lower jaw are white, and there is a patch of white on each side of the nose and upper lip; a black line reaches from the nostril to the edge of the lip, and also passes around the lower jaw.

The tuft of hair on the inside of the hock joint is short, and there is no gland on the metatarsal bones.

This deer does not change its color with the seasons, as other deer, but remains the same in color throughout the year. The doe resembles the buck in color, but is somewhat smaller, and has no horns. The fawns when born are of a dark reddish-brown, spotted with white, on the body; the legs inclining to gray. At about six months of age they assume the color of the adult. The horns are short, a single straight beam with one short tine projecting inwards;

the general direction of the beam is upwards and backwards in a line with the face; the horns are cast in March.

This deer has been brought to the Northern States, and yet the change of climate has produced no change in the color of the pelage, it remaining of a uniform color, very similar to what is known as the blue coat of the *Cervus Virginianus.*

DIMENSIONS.

	Ft.	In.
Length from tip of nose to root of tail,	3	10
" of tail including hair,		8
" " " without "		5½
" " head,		10½
" from tip of nose to inner canthus,		5
Height at shoulder,	2	
" " "	2	2
Girth behind shoulder,	2	
Length of ear,		5½
" " fore leg,	1	4
" " hind "	1	10
Weight, 55 lbs.		
Length of horns,		7½
" " tine,		1

XIX—On the Lingual Dentition of Certain Terrestrial Pulmonata Foreign to the United States.

BY THOMAS BLAND AND W. G. BINNEY.

Read Dec. 9, 1872,

Helix Jayana, C. B. ADAMS (*Sagda*).

Like *Sagda connectens* C. B. Adams and *Sagda Haldemaniana* C. B. Adams (see Amer. Jour. Conch. VII, p. 175), this, also a Jamaica species, has quadrate, not aculeate, marginal teeth on its lingual membrane. The cusps of the marginals are short, stout and blunt, centrals and laterals as usual.

Jaw smooth anteriorly, with scarcely any median projection to its cutting edge.

This is an additional proof of the position of *Sagda* being among the *Helicea* rather than the *Vitrinea* of von Marten's arrangement.

We received from Mr. Henry Vendryes the specimen examined.

Leucochroa Boissieri, CHARP.

The genus *Leucochroa* is adopted by von Martens (Die Heliceen ed. 2, p. 78) the type being *Helix candidissima* Drap, a species whose anatomy has been described by Moquin-Tandon as being more nearly related to *Zonites*, than to *Helix*. The genus is classed by von Martens among the *Vitrinea*, the section of *Helicea* containing the genera furnished with ribless anterior surface and median projection to the jaw, and aculeate, marginal teeth to the lingual membrane. Among the species catalogued by von Martens is *Leucochroa Boissieri* Charp. Having sometime since received a specimen of this species from Mr. John Van Nostrand, collected by him in Palestine, we have examined its jaw and lingual dentition with the following results.

Jaw very low, long, arcuate, ends but little attenuated, bluntly rounded. Cutting edge with a decided median projection, anterior surface free from ribs, with a strong, transverse line of reinforcement. The jaw resembles that of *Clausilia* or *Pupa* more than that usually found in *Helix*.

Lingual membrane as usual in the *Helicidæ*. Centrals short and stout with a bluntly pointed median tooth, the side teeth almost obsolete. Laterals with a very long, oblique, blunt inner tooth, the outer tooth almost obsolete. Marginals subquadrate, with several short, blunt, papillæ-like teeth.

From the above it will be seen that *Leucochroa Boissieri* must be classed among the *Helicea*, its lingual membrane having the quadrate type of marginal teeth, and not the aculeate type common to *Vitrina*, *Zonites* and other *Vitrinea*. Its jaw is of the form often found in the *Helicea*. Judging from both jaw and lingual membrane, we would not separate the species from the genus *Helix* as received by von Martens. We are inclined to believe that further investigations will prove the genus *Leucochroa* to be only a subgenus of *Helix*, in the arrangement of "Die Heliceen."

Helix circumfirmata, REDFIELD.

Lingual membrane long and broad, centrals tricuspid, laterals bicuspid, cusps long and slender, marginals aculeate.

From the above description it will appear that this species belongs to the *Vitrinea* rather than to the *Helicea* of von Marten's arrangement, in which latter it is classed in "Die Heliceen" as a species of the subgenus *Microphysa*.

Helix Bermudensis, PFR.

Jaw extremely thin, arched, with a blunt, median projection to its cutting edge.

Lingual membrane long and narrow. Central teeth tricuspid, laterals bicuspid; the cusps in each long and slender. Marginals numerous aculeate in oblique rows.

As in the *H. circumfirmata*, the result of our examination of the lingual membrane throws light on the generic position of this species. It can no longer be retained in *Caracolus*, a sub-genus of *Helix*, as it has the dentition of the *Vitrinea* of von Marten's arrangement. For the specimens examined of this and the preceding species, both from Bermuda, we are indebted to Mr. J. J. Crooke.

Helix perplexa, FER. (*Dentellaria*).

Jaw with a median projection to its cutting edge. The anterior surface of the jaw is of irregular thickness, showing some approach to the ribbed form of jaw.

Lingual membrane as usual. Central and lateral teeth with short, stout, blunt cusps. Marginal teeth quadrate, with one wide, stout, bluntly rounded median cusp, and two small, blunt side cusps.

We are indebted to Governor Rawson for this specimen collected in the Island of Grenada.

Pupa sulcata, MULLER (*Gonidomus*).

Lingual membrane long and very narrow. Rows of teeth arranged *en chevron.* Teeth separated, aculeate, as in *Pupa palanga* Lesson photographed by us, (Amer. Jour. Conch. V. pl. XI. fig. 1.)

We obtained no jaw on boiling the buccal mass in a solution of caustic potash.

This species belongs to the genus *Gonospira*, in which *P. palanga* was placed by Crosse and Fischer (Journal de Conch. IX, 213, (1869) pl. XI, figs. 6–8).

The specimen examined, sent from Mauritius by Consul Pike, was kindly supplied by Mr. John G. Anthony.

Bulimus aulacostylus, PFR. (*Eurytus*).

Lingual membrane as usual in the genus, the marginal teeth simply modified from the laterals.

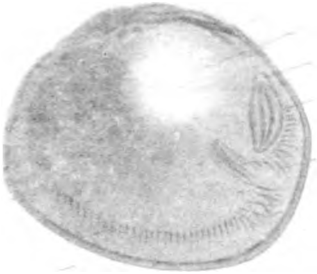
Jaw slightly arcuate, membranous, almost transparent, in one single piece, but divided by delicate ribs into more than sixty plate-like sections, as common in the genus *Bulimulus*, *Cylindrella*, etc. No upper median triangular plate, but the ribs run somewhat obliquely to the centre.

We are indebted for this specimen from St. Lucia, and for the following from St. Vincent, to Govenor Rawson.

Bulimus auris-sileni, BORN (*Pelecychilus*).

Jaw and lingual membrane as in the last species. The middle cusp of the central teeth and inner cusp of the lateral teeth long, acute.

The jaw of this and the preceding species do not agree with the generic description of von Martens "costis validis exarata," but are like that of *Bulimulus*. This fact gives still more proof of the difficulty of classifying the *Bulimi* by their jaw, at the present stage of our knowledge of the subject as already remarked by Fischer (Jour. de Conch. XII, 295, 1872).



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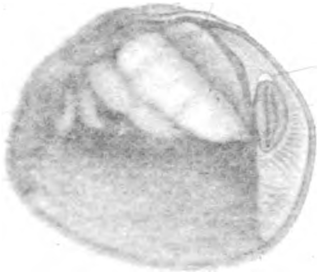

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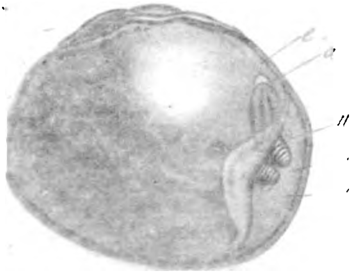

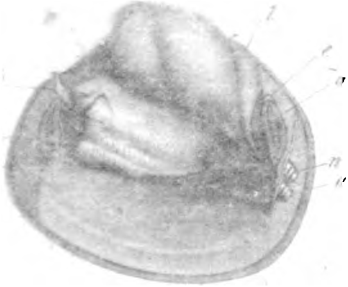

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[illegible] from Mauritius by [illegible] Mr. John G. Anthony.

[illegible], Fis. (*[illegible]*).

[illegible] usual in [illegible], the marginal teeth [illegible]

[illegible] almost transparent, in [illegible] more than sixty plate-like sections, [illegible] No upper median [illegible] to the centre.

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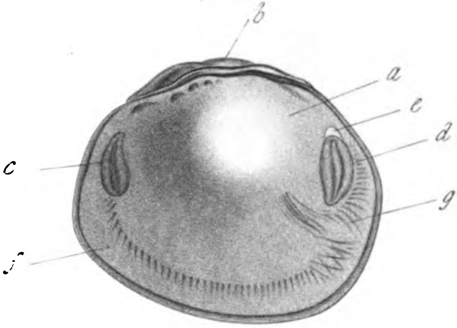

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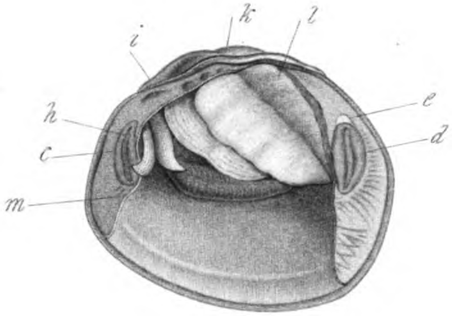

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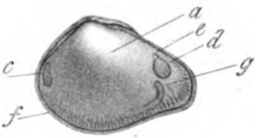

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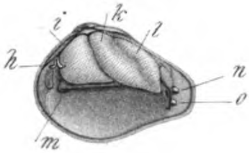

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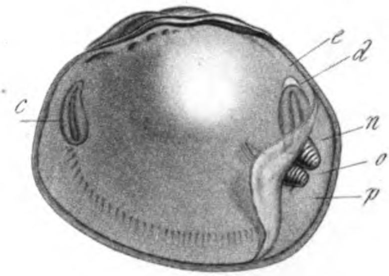

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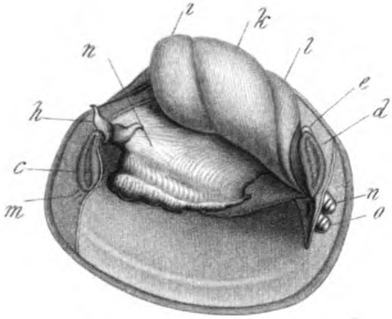

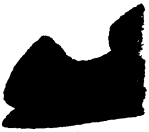
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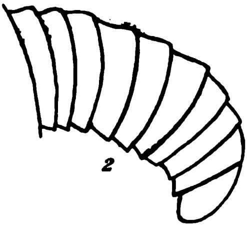
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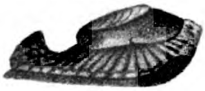
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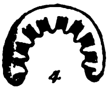
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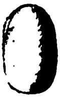
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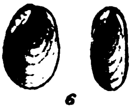
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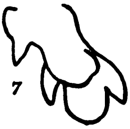
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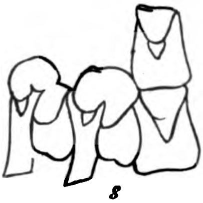
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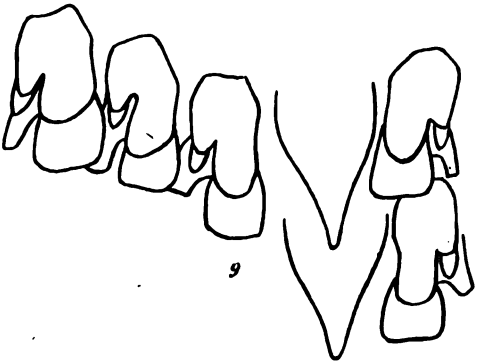
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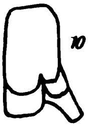
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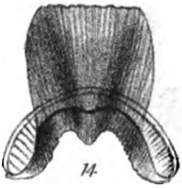
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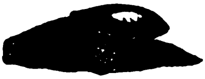
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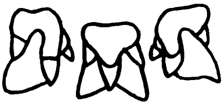
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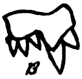
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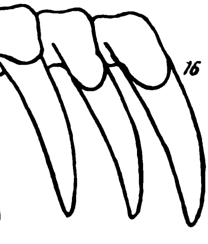
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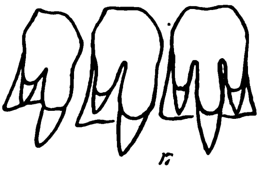
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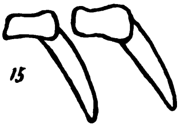
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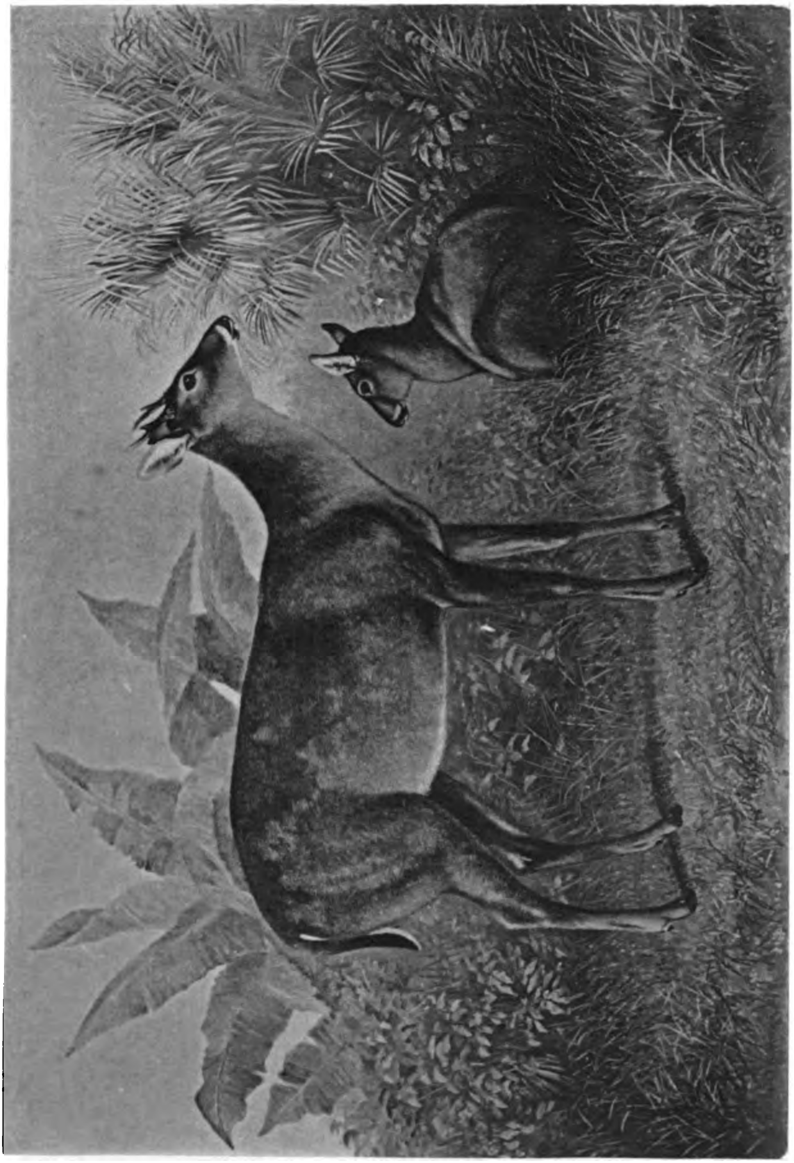

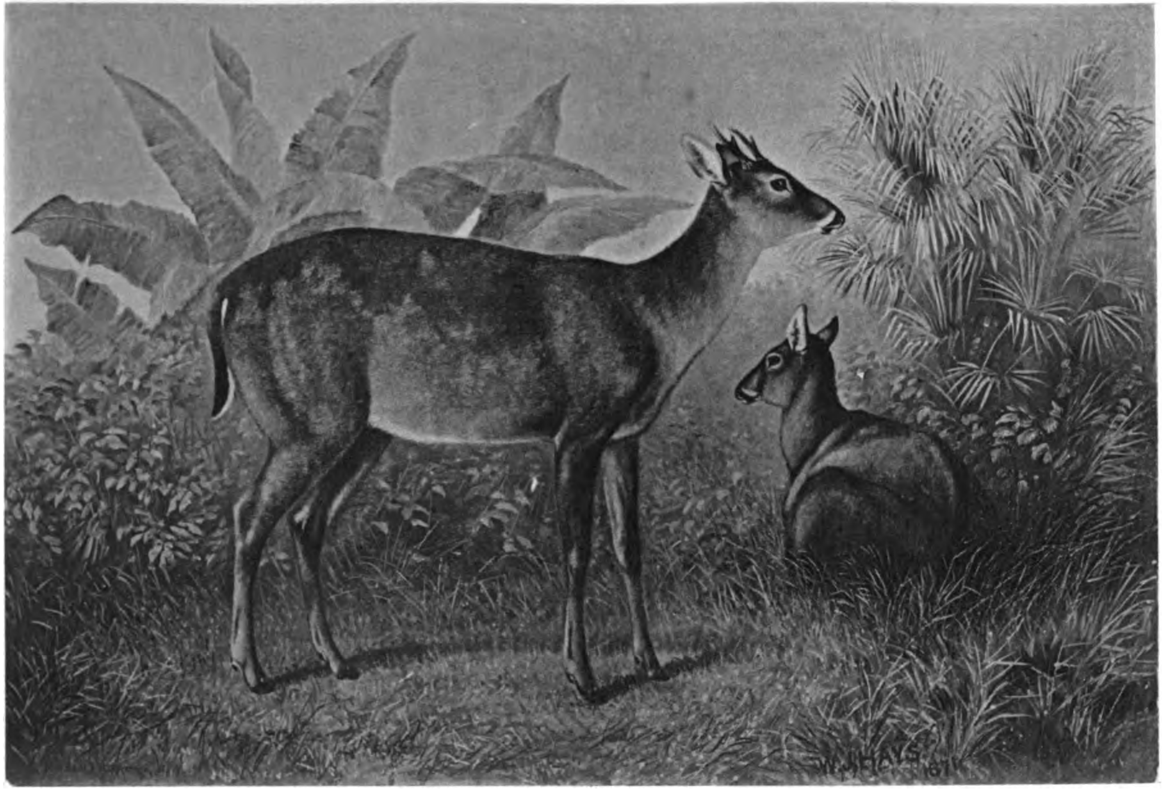
W. J. HAYS 67

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CONTENTS.

XXV.—Note on the Coals of the Kanawha Valley, West Virginia. By Jno. J. Stevenson, Ph. D. (With plate XII.) 271

XXVI.—On the Subdivisions of Science and their Classification. By Louis Elsberg, M. D. (With a table.) 277

XXVII.—On Prophysaon, a new Pulmonate Mollusk, on Ariolimax, on Helix lychnuchus, and other species. By Thomas Bland and W. G. Binney. (With plates XIII and XIV.) 293

XXVIII.—On the Physical Geography of, and the Distribution of Terrestrial Mollusca in, the Bahama Islands. By Thomas Bland, ... 311

XXIX.—Spectroscopic Examination of Silicates. By Albert R. Leeds, ... 324

1874 Jan. 30

Vol. X. January—February, 1873. No. 9.

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ADDITIONAL NOTE ON THE GENUS AMPHIBULIMA.

SINCE our paper "On The Relations of Certain Genera of Terrestrial Mollusca of, or related to, the Sub-family Succininæ, with Notes on the Lingual Dentition of Succinea appendiculata Pfr." (pp. 198-207) was printed, we have received, through the kindness of Dr. W. J. Branch of the island of St. Kitts, two specimens of *Amphibulima patula* with the animals, preserved in glycerine, and can in consequence offer a decided opinion as to the generic relations of the species.

Finding a note among the papers of the late Mr. Robert Swift to the effect that "*S. patula* Brug. is found at St. Kitts on Bayford's estate on the wild plantain which grows on the banks of a small water-course," Bland wrote on the 21st November last, requesting Dr. W. J. Branch, a correspondent of Mr. Swift and also of Governor Rawson, to obtain specimens, if possible, for examination. To this request Dr. Branch most kindly responded. We subjoin a copy of his interesting letter, which accompanied the specimens.

"I went a few days ago to Bayford's to look for the *S. patula* but, after a long and fatiguing search, found only two small (young) specimens. When I was in the place several years since, the bushes on each side of the little river were covered with snails* (a striped *Bulimus*, a species of *Helicina* and the *S. patula*), but the other day I saw only three arboreal snails. The present scarcity of these creatures in St. Kitts is probably due to the hurricane which visited the island in 1870. Many trees, some of enormous size, were torn up by the roots, others lost all their branches, and scarcely a single leaf was left on any tree. The supply of water to the estates was cut off or much diminished by the drying up of the numerous streams from the mountains. This was, no doubt, caused by the want of foliage to protect the moisture, which collects on the slopes of well-wooded hills, from the sun's heat. So the poor snails have come to grief from the actual violence of the hurricane itself, and the subsequent cutting off of their supplies both of meat and drink.

You will see that both the snails sent are completely tucked into their shells, but I do not think that they often, or perhaps ever, draw in either the head or the posterior part of the foot during life. Their flesh is particularly watery and gelatinous and shrinks up as they die. When they are moving about, the foot looks very large and when I touched the creature it could not or would not retreat into its shell. On this point, however, I shall be able to give more accurate information when I can collect additional specimens."

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* *B. multifasciatus* Lam. and *H. fasciata* Lam. (T. B.)

We find that the animals are completely retracted into their shells and very much in the same manner as in *Succinea*, little more than the entire surface of the foot being alone seen within the aperture, the edges of the peristome projecting slightly beyond it. While the sensitiveness of the animal to touch may be slight, and its habit as described by Dr. Branch, they cannot be said to be much larger than their shells, as remarked by Sallé of *Xanthonyx*, and described by Fischer and Crosse, or as described by Dr. Cooper of *Binneia*. The specimens, for which we are indebted to Dr. Branch, must have been taken alive in the month of December, and very soon at least after death, before becoming dry, put in the glycerine.

It will be remembered that Guppy considers *Omalonyx* and *Brachyspira* as groups or sections of *Amphibulima*. In a very recent letter he repeats his assurance that "the animals of both *Amphibulima patula* and *pardalina* are very much larger than the shells and quite incapable of retraction into them." His observation agrees, so far as it goes, with that of Dr. Branch, who adds a remark as to the shrinking up of the animals "as they die." This shrinking before death must be accompanied by the exercise of contractile muscular force, and probably further observation will prove that the animal, while in possession of its full vital power, can and does withdraw itself into the shell, and especially, perhaps, in seasons of drought.

The jaw of *A. patula*, of which we subjoin description, has not the accessory plate characteristic of *Succinea*, and which is found in *Omalonyx* and *Brachyspira;* while the latter subgenera therefore belong to the *Succininæ*, *Amphibulima* must be associated with the *Helicinæ*. By the character of the ribs of the jaw, it is most nearly allied to the genus *Bulimulus*. The same may be said of *Gæotis* lately examined by us.

Amphibulima patula.—Body obtuse in front, pointed behind, entirely retractile within the peristome, though usually greatly expanded. Mantle simple as in *Succinea*, *Helix*, etc. Base of foot wrinkled transversely, without distinct locomotive disk. Generative orifice? Respiratory orifice?

Jaw slightly arcuate, low, ends attenuated: extremely thin and transparent with prominent transverse striæ; divided longitudinally by about forty-five delicate ribs into so many plate-like sections of the same character as those of *Cylindrella*, *Macroceramus* and many species of *Bulimulus*. No upper triangular median plates as in *Cylindrella*. Margin serrated by extremities of ribs.

The figure we have given of the jaw of *Succinea? appendiculata* Pfr. (Ann. Lyc. Nat. Hist. N. Y., X, pl. ix, fig. 2) offers a correct general idea of the jaw of *Amphibulima patula*. See also our photograph of jaw of *Cylindrella rosea* (Am. Journ. Conch., V, pl. xi, fig. 2) for the character of the ribs and plate-like sections.

Lingual membrane as already described and figured by us from a specimen from Dominica (See Am. Journ. Conch., VII, 186, pl. xvii, figs. 1-2), long and broad, composed of numerous horizontally waving rows of teeth, of the form usual in the *Helicidæ*. Centrals subquadrate, extended at basal angles, narrowing towards the centre, expanding towards the upper edge, which is reflected and tricuspid, extending quite to the base of the tooth; the cusps are stout, the median one bluntly pointed. The lateral teeth are of the same type as the centrals, but unsymmetrical. The marginals are long and narrow, rounded at base, narrowed at apex, reflected and bicuspid; cusps short, stout, and generally a simple modification of those of the laterals. The extreme marginals have irregular teeth, like simple papillæ.

XX. — *The Upper Coal Measures West of the Alleghany Mountains.*

BY JNO. J. STEVENSON, PH.D.

Read December 16, 1872.

WHILE connected with the Geological Survey of Ohio, I was employed in investigating the Upper Coals as displayed in the First Geological District of the state. The relations of the coal beds to each other, and the marked changes in the intervening strata, seemed to be at variance with some accepted opinions and induced me to make diligent comparison of the Ohio coals with those of Pennsylvania and West Virginia. The results of this examination appear, to me, of sufficient importance to warrant publication in advance of the Ohio Report. This I am permitted to do by the courtesy of Prof. Newberry, chief geologist of Ohio.

The observations recorded in this paper cover only that portion of the field north of the Baltimore and Ohio railroad in West Virginia and Ohio.

LIMITS OF THE UPPER COALS.

The outcrop of the Pittsburg coal, the base of the Upper Coal Measures, beginning at the Baltimore and Ohio railroad in West Virginia runs northward, rudely parallel to Laurel Hill, through Marion and Monongalia counties, W. Va., and Fayette and Westmoreland, Penn., thence westwardly, through Westmoreland and Alleghany into Hancock, W. Va. Crossing the Ohio just above Steubenville it passes through Jefferson, Harrison and Belmont into Guernsey where it reaches the Baltimore and Ohio railroad at Salesville, thirty-seven miles west from the Ohio river. That this is by no means the original extent is evident from several facts. In Pennsylvania, the Frostburg and Broad Top basins lying to the east of the main outcrop have been proved to contain the upper coals, and some of our leading geologists profess to find equivalents of the same beds in the anthracite region. In Ohio, west of the line of outcrop, isolated patches are found in the synclinal passing through Guernsey county, ten to fifteen miles away. At New Concord, Muskingum Co., Ohio, twenty-three miles west from Salesville, there is a thin coal resting on a heavy buff colored fossiliferous limestone and occupying both sides of the synclinal trough, of which the bottom is at that village. About fifty feet below it is a hard limestone, bluish-gray in color and fossiliferous, known in the Ohio section as the *Crinoidal Limestone*, a persistent stratum traceable into Pennsylvania and West Virginia.

Along the western outcrop of the Pittsburg coal the *Crinoidal Limestone* is found at a distance, varying little from one hundred and fifty feet, below the coal, and the interval is occupied by variegated shales and shaly sandstones, with no coal or even bituminous shale. From four to ten feet below the coal there is a tough limestone, varying in color, four to six feet thick and more or less fossiliferous. It would seem then from the accompanying rocks that the New Concord coal is the western prolongation of the *Pittsburg*. It is true that the interval between it and the *Crinoidal Limestone* is at that place very much less than at Salesville, twenty-three miles east, but even this is an additional proof of identity, for this interval increases eastward. Three miles northwest from New Concord it is barely thirty-five feet; at Concord it is fifty; at Salesville it is one hundred and fifty; while in the Monongahela Valley it is two hundred and fifty.

The *Crinoidal Limestone* has been traced to within three miles of the Muskingum river on the west and thence round to the borders of Tuscarawas and Stark, on the northwest and into Columbiana and Mahoning on the north. So constant and regular is it in its relations to the Pittsburg coal, that we may regard its distribution as an indication of the original extent of that bed. Accepting this then as a basis for the calculation we conclude that that coal once reached as far west as Sonora on the Central Ohio railroad, seventy-one miles west from Wheeling, and to a point northward not less than fifty miles from that city, a tortuous boundary line connecting the two points.

RELATIONS OF THE SEVERAL COAL BEDS IN OHIO, PENNSYLVANIA AND WEST VIRGINIA.

To ascertain the relation of the Ohio coals to those of Pennsylvania and West Virginia the following sections are compared:

- I. From Kirkwood Township, Belmont Co., Ohio.
- II. From the Central Ohio railroad between the Ohio river and the Barnesville summit.
- III. From Wheeling, W. Va.
- IV. From Wheeling creek, W. Va.
- V. From Scott's Run, Monongalia Co. W. Va.
- VI. From Uniontown, Fayette Co., Penn. (Rogers.)

I.		II.		III.	
1. Debris,	150'	1. Sandstone,	40'	1. Sandstone,	7'
2. *Coal* XIII,	1½'	2. *Coal* XIII,	1'	2. *Coal*, Waynesburg,	3'
3. Sandstone,	70'	3. Sandstone,	70'	3. Shale,	33'
4. *Coal* XII,	1½'	4. *Coal* XII,	1'	4. Limestone,	15'
5. Shale and Sandstone,	40'	5. Shale,	35'	5. Sandstone,	3'
6. *Coal* XI,	2'	6. *Coal* XI,	1¼'	6. Limestone and Shale,	95'
7. Sandstone with thin Limestone,	100'	7. Sandstone,	100'	7. Shale,	3'
8. *Coal* X,	4'	8. *Coal* X,	4½'	8. *Coal*,	1¼'
9. Sandstone,	40'	9. Sandstone,	35'	9. Shale,	6'
10. *Coal* IX,	2½'	10. *Coal* IX,	2½'	10. *Coal*,	1'
11. Limestone,	70'	11. Limestone,	70'	11. Clay,	6'
12. Shale,	6'	12. *Coal* VIII *c*,	4'	12. Sandstone,	8'
13. *Coal* VIII,	8'	13. Sandstone,	35	13. *Coal*, Sewickly,	1⅜'
14. Fireclay,	5'	14. *Coal* VIII *b*,	½'	14. Limestone,	24'
15. Limestone,	6'	15. Limestone,	80'	15. *Coal*, Redstone,	1'
		16. *Coal* VIII *a*,	½	16. Limestone,	20'
		17. Limestone,	20'	17. Shale,	6'
		18. Shale,	10'	18. *Coal*, Pittsburg,	8'
		19. *Coal* VIII,	9'		

IV.		V.		VI.	
1. Sandstone,	5'	1. Sandstone,	40'	1. Limestone,	12'
2. Limestone and shale,	3'	2. Shale,	1-20'	2. Not well exposed but containing much limestone.	—
3. *Coal*, Waynesburg,	8'	3. *Coal*, Waynesburg,	9'	3. Shale,	15'
4. Shale,	38'	4. Sandstone,	15'	4. Sandstone and limestone,	110'
5. Limestone,	1'	5. Shale,	8'	5. *Coal*, Sewickly,	4'
6. Shale,	40'	6. Limestone,	5'	6. Shale,	2'
7. Limestone and shale,	100'	7. Shale,	4'	7. Limestone,	6'
8. *Coal*,	3'	8. Sandstone and shale,	15'	8. Shale,	41' ?
9. Clay,	2'	9. Limestone and shale,	30'	9. *Coal*, Redstone,	2'
10. Sandstone,	15'	10. Shale and sandstone,	25'	10. Shale with calcareous nodules,	15'
11. *Coal*, Sewickly,	3½'	11. Limestone,	6'	11. Sandstone,	5'
12. Limestone,	55'	12. Sandstone,	15'	12. Shales,	15'
13. Shale,	5'	13. Limestone,	7'	13. *Coal*, Pittsburg,	10'
14. *Coal*, Pittsburg,	7'	14. Sandstone,	10'		
15. Fireclay,	2'	15. Limestone,	8'		
		16. Shale,	12'		
		17. Sandstone,	11'		
		18. Arenaceous shale,	20'		
		19. *Coal*, Sewickly,	5'		
		20. Shale,	8'		
		21. Limestone,	7'		
		22. Sandstone,	10'		
		23. Limestone,	22'		
		24. *Coal*, Redstone,	4'		
		25. Limestone,	12'		
		26. Shale,	8'		
		27. *Coal*, Pittsburg,	14'		

The discrepancy between the two Ohio sections will be discussed in another portion of the paper.

Taking *Coal* VIII of the Ohio section as our basis, we have a definite starting point, as that is the *Pittsburg*. VIII *a* is present at Wheeling; does not appear at Wheeling creek, owing probably to imperfect exposure, but reappears on the east side as the *Redstone*. VIII *b* is seen in all the sections and is the *Sewickly*. VIII *c* crosses the Ohio, is traceable along Wheeling creek for several miles, but soon runs under and does not reappear on the other side. IX and X do not cross the river into West Virginia, the former disappearing two miles west from the Ohio, while the latter is seen as a mere streak in the hills opposite Wheeling. It is possible, however, that careful tracing round by the north may establish some connection between our *Coal* X and the *Uniontown coal* of Pennsylvania. *Coal* XI is persistent throughout, and is the *Waynesburg*. XII was not seen by me at Wheeling, though it is probably the bed noted by Mr. Briggs, eighty-two feet above the last. At Waynesburg and Uniontown, the interval is from fifty to sixty feet. Erosion has so removed *Coal* XIII and its adjoining rocks that it is to be seen at no point near the Ohio river, but its equivalent in Pennsylvania is doubtless the top coal at Waynesburg and Uniontown, fifty-five feet above the last. These two beds exist in West Virginia on the east side of the basin, but owing to the poverty of exposures no definite statement can be made respecting them.

The relations of the coals in the several states may therefore be represented as follows:

OHIO.	PENNSYLVANIA.	WEST VIRGINIA.
Coal XIII.	*Top* at Waynesburg.	?
Coal XII.	*Middle* at Waynesburg.	?
Coal XI.	*Waynesburg.*	*Waynesburg.*
Coal X.	*Uniontown?*	Not present.
Coal IX.	Not present.	Not present.
Coal VIII *c*.	Not present.	Not present (east side of basin).
Coal VIII *b*.	*Sewickly.*	*Sewickly.*
Coal VIII *a*.	*Redstone.*	*Redstone.*
Coal VIII.	*Pittsburg.*	*Pittsburg.*

DESCRIPTION OF THE BEDS.

Coals XII and XIII of the Ohio section are seen at few localities and are of economical importance nowhere. The former is enormously developed in the hills opposite Wheeling, where it is a dry coal, six feet thick, but heavily charged with pyrites.

The *Waynesburg* (XI) is commonly known in western Belmont Co., Ohio, as the "jumping six-foot seam" owing to its sudden variations in thickness. In Harrison and Jefferson counties, it is worthless, never more than two feet thick, and is seen only near the tops of the highest hills. In western Belmont it is not worked and varies from six inches to nearly six feet in thickness. This change is seen in a cut west from Barnesville, at one end of which it is barely six inches while at the other it shows the following section:

Coal, 1 ft.; shale, 4 in.; *coal*, 4 in.; shale, 4 in.; *coal*, 4 in.; shale, 2 ft.; *coal*, 1 ft. Total, 5 ft. 4 in.

Seven miles east from Barnesville it is seen in a cut, about one foot thick and parted in the middle by a thin layer of limestone. Near St. Clairsville, in the same county, it is rudely worked and shows three feet of very impure coal, resting almost immediately upon a foot of limestone. Near Bridgeport, opposite Wheeling, it is three feet six inches thick, roofed by six inches of impure black band which is overlaid by two feet of alternating bands of bituminous and ordinary shale. Here the limestone is eighteen inches below the coal. On a run four miles west from Belleair and just south of the railroad, it suddenly thickens out and becomes a confused mass of coal and shale not less than fifteen feet thick, and totally worthless.

Followed into West Virginia it is seen on the top of Wheeling Hill, just back of the city. On Wheeling creek it is worked at Roney's Point, ten miles from the city, and proves to be a very good coal varying from two feet four inches to three feet thick. It is seen somewhat thicker on the south fork of the creek. On the eastern side of the basin it is seen at several points along Scott's and Robinson's Runs, in Monongalia Co., W. Va., as well as in Greene Co., Penn. Its greatest development is seen on Scott's Run, where its changes are almost as interesting as in Belmont Co. Ohio. Two miles and a half up the run several openings are seen which give the following section:

Coal, 1 ft. 9 in.; Bituminous shale, 8 in. *Coal*, 4 ft. 8 in.

Two miles farther up the run the shale has disappeared, and at an opening near Cassville, the bed shows full nine feet of coal. One mile beyond, the following section was obtained:

Blue clay, 6 in.; slaty *coal*, 1 ft. 3 in.; clay, with many impressions of plants, 3 to 6 in.; *coal*, 2 in.; clay, 2 in.; *coal*, 7½ in.; clay, 1 ft. 1 in.; *coal*, seen, 4 ft. 2 in.

This opening is likely to prove of considerable interest as the fossils are very numerous and well preserved, while the horizon at which they occur is more than one hundred feet higher than any other yet discovered in the northern portion of the trough. On Robinson's Run the bed shows a tendency to develop in the same manner as follows:

Bituminous shale, with thin laminæ of *coal*, 2 ft.; *coal*, 1 ft. 6 in.; clay, 7 in.; *coal*, 4 ft. 8 in.

Towards the south it rapidly diminishes in thickness and apparently thins out.

In Pennsylvania the bed is usually double, but is nowhere so greatly developed as on Scott's Run. Near Waynesburg it shows *coal*, 1 ft. 8 in.; clay, 1 ft. 2 in.; *coal*, 3 ft. 2 in. Near Carmichaeltown, Greene Co., it shows *coal*, 3 ft.; clay, 3 in.; *coal*, 3 ft. The clay is sometimes replaced by black slate with innumerable thin laminæ of coal (Rogers). Near Brownsville it is five feet thick and single.

In West Virginia the coal from this bed is dry, almost open-burning, gives a strong fire and is highly valued for domestic purposes. It contains a large proportion of pyrites, sufficient probably to render it unfit for general use. In Pennsylvania its quality is inferior to that of coal from the *Pittsburg*, while in Ohio, it is, for the most part, utterly worthless.

Coal X of the Ohio section is traceable through Belmont, Harrison and Jefferson counties, Ohio. It is usually a double bed and in some localities is still further divided. At the most westerly opening seen, in Warren Township, Belmont Co., it shows: slaty *coal*, 1 ft 6 in. *Coal*, good, 3 ft.

At Badgersburg in the adjoining township it displays the double character more clearly as follows:

Laminated shale, 4 ft.; *coal*, slaty, 1 ft. 7 in.; shale and clay, 1 ft. 8 in.; *coal*, 5 ft.; fireclay, 1 ft.

Here the coal is of good quality and compares favorably with that obtained from the *Pittsburg*, but the bed is much cut up by "clay-veins" and "horse-backs" both from above and from below, difficulties which seem to beset it generally. In Union township the bed is seen triple in Section 25 as follows:

Coal, 1 ft.; clay, 1 ft. 3 in.; *coal*, 4 ft. 6 in.; shale, 1 ft.; *coal*, slaty, 1 ft.; fireclay, 1 ft. 3 in.

Near the village of Flushing it is worked at many openings. While varying little in thickness it is exceedingly uncertain in quality; some banks yielding coal well fitted for blacksmiths' use, while that from others in the immediate neighborhood is hardly fit for the coarsest of domestic purposes. The general section there is

Coal, 1 ft. 2 in.; shale and clay, 1 ft. 4 in.; *coal*, 3 ft. to 4 ft.

As this bed is followed eastward toward the Ohio river it is seen to lose its thickness gradually, soon becoming of no economical importance and finally thinning out near the river. In Harrison Co., it is frequently seen at the roadsides; but few openings are found owing to the ready accessibility and better quality of the *Pittsburg*. Near New Athens the following section was obtained:

Shale, 6 ft.; *coal*, 10 in.; fireclay, 10 in.; shale, 1 ft. 8 in.; *coal*, 4 ft. 8 in.; shale, 3 ft.; *coal*, 4 in.; shale, 3 ft.

Near Cadiz the same section is repeated. In Jefferson Co., the coal is frequently seen at the roadside but is so degraded as to be worthless. It is little more than a bituminous shale, two to three feet thick. It may be the coal at Knoxville one hundred feet above VIII, but is there not more than eighteen inches.

Coal IX likewise thins out before reaching the Ohio. It is seen at numerous localities in Belmont, Harrison and Jefferson counties, at varying distance above the *Pittsburg* and is usually about two feet six inches thick, divided midway by a thin clay parting. It is very persistent, rests directly on limestone and being of no economical value, is interesting chiefly because of its relations to the *Pittsburg*, which will be considered farther on. It is thickest in its southeastern prolongation and thins out toward the borders of the basin, W. and N.

Coal VIII *c* is known locally in Ohio as the *Glenco Coal*, having been worked somewhat extensively at the station of that name, on the Central Ohio railroad, where it is nearly four feet. Along the railroad it retains its size to Belleair, but from that point northward it diminishes rapidly, becoming three feet along Wheeling creek and only fifteen inches at Martinsville, five miles north from Belleair. In West Virginia, from Benwood to Wheeling it shows some singular variations. Back of the furnace at Benwood it is eighteen inches; at the stone quarry, a short distance north, it is six inches, with one foot of coal five feet above it; at the limestone quarry near South Wheeling, it is eight inches and the upper bed concealed; while at Wheeling it is one foot with fourteen inches of coal six feet above it. Followed up the north fork of Wheeling creek it becomes more important and is mined near Triadelphia where it shows about three feet of very fair cannel. The double character displayed along the Ohio, on the Virginia side, is occasionally exhibited in Belmont Co., but never to any very marked degree.

The *Sewickly* (VIII *b*) is confined, in Ohio, to the neighborhood of Wheeling. It may be seen on the National Road, five miles west from the river and near Glenco on the Central Ohio railroad. At Belleair it is only six inches thick and at Bridgeport barely one foot. At Benwood, on the Virginia side, it shows:

Coal, 12½ in.; clay, 4½ in.; *coal*, 8½ in.; slaty *coal*, 5 in. Total, 2 ft. 6½ in.

From this point to Wheeling it runs about two feet, but at Wheeling it is much degraded and shows bituminous shale, 8 in.; clay, 4 in.; *coal*, 8 in. On Wheeling Creek, it shows a very complex division.

Coal, 1 in.; shale, 1 ft. 3 in.; *coal*, 1 ft. 1 in.; clay, 3 in.; *coal*, 10 in.

It disappears under Wheeling creek about five miles east from Wheeling. It reappears on Scott's Run, in Monongalia Co., greatly increased in thickness and much changed in character. Where first seen above the run, it is five feet eight inches thick; a short distance beyond, it is five feet and on the bank of the Monongahela river it is six feet. At all of these openings it is divided about midway by a layer of cannel from two to six inches thick. On Robinson's Run it is four feet six inches, with a clay parting midway and the cannel layer only one foot from the bottom. At its eastern outcrop near Laurel Hill it is only one foot thick, having been torn away during the deposition of its overlying sandstone. It can be traced southward to the Baltimore and Ohio railroad but does not retain its thickness. The coal from this bed in West Virginia on the east side of the basin is of remarkably good quality, containing only a minute proportion of pyrites and showing little tendency to cake upon the fire.

In Pennsylvania, this bed is persistent within certain limits, and varies from two to five feet in thickness.

The *Redstone* (VIII *a*), like the preceding, is seen in Ohio, only near Wheeling. At Belleair it is six inches thick imbedded in one foot of black shale and enclosed by the limestone. At the limestone quarry near Benwood, W. Va., it is barely one foot thick, a confused mass of shale and coal. At Wheeling it has the same character. On Scott's and Robinson's Runs, in Monongalia Co., it is from three to four feet thick, and yields a coking coal of very superior quality. In Pennsylvania it is a variable coal, ranging from eighteen inches to four feet in thickness.

The *Pittsburg* (VIII) is well exposed in Belmont, Guernsey, Harrison and Jefferson counties, Ohio, as well as in Ohio, Brooke, Marion, and Monongalia counties, West Virginia. Its most westerly exposure, aside from isolated patches, is at Salesville, on the Central Ohio railroad, thirty-seven miles west from Wheeling, and its most northerly exposure, at Knoxville, Jefferson Co., about the same distance north from Wheeling. Wherever accompanied by its normal roof, shale, succeeded by limestone, it is a double bed, consisting of two or even more divisions of coal separated by shale or clay.

In Guernsey and Western Belmont, where the overlying limestone shale has been removed to be replaced by sandstone, this bed has suffered the loss of its upper layers, and for the most part is single-bedded, varying from four to five feet in thickness with the sandstone resting directly upon it, or at most, separated by only a few inches of shale. In some localities the eroding current excavated deep trenches in the coal itself. These, having been filled up with sand, now appear as huge sandstone "horsebacks" from five to sixty feet wide. The change in the accompanying rocks is shown in the following sections.

No. I is from Barnesville, Belmont Co.

No. II is from Sewellsville in the same county and north from Barnesville.

No. III is from Moorfield, Harrison Co., and north from Barnesville.

No. IV is from near Deersville, " " " " " "

No. V is from Egypt, Belmont Co., a short distance east from Sewellsville.

I.	II.	III.	IV.	V.
1. *Coal* X.	1. *Coal* X.	1. Sandstone, 40′	1. Sandstone, 70′	1. *Coal* X.
2. Sandstone, 55′	2. Sandstone, 105′	2. Limestone, 4′	2. *Coal* VIII.	2. Sandstone, 85′
3. *Coal* IX, 1⅔′	3. *Coal* VIII.	3. Shale, 5′		3. *Coal* IX.
4. Limestone, 5½′		4. *Coal* VIII.		4. Limestone, 70′
5. Sandstone, 40′				5. Shale, 5′
6. *Coal* VIII.				6. *Coal* VIII.

At a short distance east from each of these localities, the heavy limestone shown in Section V is seen forty to seventy feet thick. Westward the sandstone prevails to the outcrop.

A comparison of these sections shows that the heavy limestone of Section V has been removed to be replaced by sandstone. That the entire removal, shown in Section II, was not the work of a single current is evident from Section I. The first or earlier current exerted its force before the close of the limestone-making epoch and the formation of *Coal* IX. The five and one-half feet of limestone shown in Section I yields a hydraulic current which is equal to any manufactured in our country. The upper layer of the limestone of Section V possesses hydraulic properties, where exposed, along the Central Ohio railroad, at New Egypt, Flushing, at Wheeling Creek, and at other localities in Belmont County, as well as at many places in Harrison County, so that we cannot doubt that it and the limestone at Barnesville are synchronous. The force of this earlier current must have been irregular, for at Deersville it has removed both limestone and shale, but has left the coal untouched; at Moorfield it has spared the lower layer of limestone; while at Sewellsville and Barnesville it has removed everything above the lower division of the coal and has trenched that deeply from these points westward to the outcrop. The second current did not exist until after the formation of *Coal* IX, and seems to have acted more energetically at the north than at the south. At Barnesville it spared not only the limestone but also the coal, whereas northward both were removed. The eastern boundary of these currents is very tortuous, but has a rudely northeast and southwest direction. They must have their origin in similar causes, as their courses coincide.

As already stated, the *Pittsburg*, where accompanied by its normal roof, is a double coal. The roof-coal, or upper division, is subject to much variation. The partings in the lower division are very persistent. About one foot from the top is a band of pyrites, one to two inches thick; near the middle is a clay parting, about one inch, and three to eight inches below this a second clay parting resembling the first; below this a thin band of pyrites is frequently found, but it is not persistent. The middle bench, between the clay partings, is ordinarily very pure, and well adapted to smiths' use.

In Millwood and Londonderry townships, Guernsey Co., Ohio, the coal is single-bedded, with a sandstone roof, and varies little from four feet in thickness. In Warren and Kirkwood townships, Belmont Co., wherever roofed by sandstone, it is single-bedded and badly cut out. In Oxford township, Guernsey Co., the roof-coal is occasionally seen one foot thick and separated by shale from the lower division.

Near Deersville, in Harrison Co., the coal is opened and gives the following section:—

Coal, 10 in.; clay, 10 in.; *coal*, 4 ft.

The intimate structure of the lower division, as shown in an opening here, is peculiar in the thickness of the middle bench:

Coal, 1 ft. 6 in.; pyrites band, 1½ in.; *coal*, 2 in.; clay parting, ½ in.; *coal*, 1 ft. 3 in.; clay parting, 1 in.; *coal*, 10 in.; total, 4 ft. 1 in.

In the neighborhood of these sections the coal is soft, not good for hard firing, but is quite pure and shows few streaks or nodules of pyrites. Followed eastward the coal thickens, becomes harder and less pure. About a mile west from Cadiz it shows:

Bituminous shale, 4 ft.; *coal*, 1 ft. 3 in.; clay, 1 ft. 2 in.; *coal*, 5 ft. 6 in.

At Cadiz the following section is said to exist in the shaft of the coal works:—

Coal, 2 ft.; limestone, 5 ft.; clay, 2 ft.; *coal*, 5 ft.

It is impossible to verify this report, given by the foreman, as the shaft is boarded up. If it be a true section it is exceedingly anomalous, for no such succession is to be seen in the neighborhood, and there are good exposures near by.

Through this district the coal seems to be exceedingly pure, no pyrites are visible except in the two bands, and blacksmiths pronounce the coal admirably fitted for their use. Yet analysis shows that it contains upwards of two per cent. of sulphur in its best part. That this is distributed throughout the coal as pyrites and not as an organic compound is evident from the fact that more than one-half remains after coking, forming almost two per cent. of the coke. At the most northerly exposure of the bed near Jefferson, the intimate structure of the whole bed is as follows:—

Coal, 1 ft. 6 in.; clay, 1 ft. 6 in.; *coal*, 1 ft. 9 in.; clay parting, ½ in.; *coal*, 6 in.; clay parting, ½ in.; *coal*, 1 ft. 2 in.; clay parting, ½ in.; *coal*, 1 ft. 2 in.; total of lower division, 4 ft. 8 in.

The upper pyrites band is not persistent at this opening, and where seen is one-fifth of an inch thick. The lower band was not observed. Near Hanover, at the northwestern exposure of the bed, the clay between the coals has almost disappeared, and we find

Roof-coal, 1 ft. 6 in.; clay parting, ¼ in.; *coal*, 3 ft. 11 in.

The roof-coal is slaty and easily recognized as separate from the main coal below. In Jefferson Co., this bed lies for the most part high up in the hills, and there are few extensive openings. Near Unionport, on the Panhandle road, at the northern outcrop, several banks have been opened, but none of them show the roof-coal. The roof is shale succeeded by sandstone, and the coal is 4 ft. 2 in. to 4 ft. 9 in. thick, with the following structure.

Coal, 1 ft. 2 in.; clay, ⅜ in.; *coal*, 6 in.; clay ½ in.; *coal*, 9½ in.; clay, ½ in.; *coal*, 1 in.; clay, ½ in; *coal*, 2 ft.

The pyrites bands are not persistent here but streaks and nodules are quite numerous. At another opening about half a mile from these, the roof-coal is still absent, the roof being shale, six feet thick, succeeded by sandstone. Following the road from Unionport to York several openings are seen, at one of which the following section was obtained:

Coal, 1 ft. 6 in.; clay, 10 in.; *coal*, 5 ft. to 5 ft. 6 in.

The roof-coal throughout this district seldom exceeds ten inches and the lower coal is much injured by pyrites both in nodules and streaks. In the neighborhood of Mt. Pleasant the roof-coal varies from one to three feet, and on Rush Run it is said to be five feet at one opening, though only three feet were exposed at the time of my visit.

In Belmont Co., at Hendrysburg, just east of the sandstone deposit the coal shows:

Coal, 10 in.; clay, 4 in.; shale with thin laminæ of *coal*, 1 ft.; *coal*, 4 ft. 8 in. On Jug Run, a tributary of Wheeling creek, the roof-coal is divided, a condition rarely seen in Ohio, except along Wheeling creek, where it is quite common. The section is

Coal, 6 in.; clay, 8 in.; *coal*, 10–15 in.; clay 10–15 in.; *coal*, 5 ft.

In Colerain township, on Hughes' Run, the lower division becomes 5 ft. 8 in.

On Barr's Run, the subdivision of the roof-coal is extraordinary, as follows:

Coal, 3 in.; black shale, ½ in.; *coal*, 1½ in.; shale ½ in.; *coal*, 10 in.; shale, 1 in.; *coal*, 1½ in.; shale 5 in.; coal 1½ in.; with the lower division 4 ft. 10 in. seen.

In Pease township, on Wheeling creek, the whole bed is greatly expanded. At one opening we find

Coal, 1 ft. 6 in.; shale 8 in.; *coal*, 10 to 18 in.; clay, 8 in.; *coal*, 5 ft. 2 in. to 6 ft. In one or two neighboring openings the lower coal becomes seven feet. Here the coal is of excellent quality for fuel, though containing too much sulphur to be of value in the manufacture of iron or gas. The intimate structure of the lower bed is shown here to be

Coal, 2 ft. 5 in.; parting, 1 in.; *coal*, 3 in.; parting, 1 in.; *coal*, 3 ft. to 3 ft. 6 in.

The upper pyrites band is seen persistently at from twelve to fourteen inches from the top, and the clay partings are full of pyrites. Nodules occur occasionally, but are small and easily separated. Along the Ohio river the roof-coal again becomes single, while the lower coal retains its thickness. Two or three miles above Martinsville we find *coal*, 2 ft.; clay, 6 in. to 2 ft.; *coal*, 4 ft. 9 in. to 6 ft.

Here the roof-coal has not been mined. It is usually left with the clay parting to make a firm roof. The clay is much slickensided, rendering it liable to fall after removal of the coal below.

Crossing the river into West Virginia we find this coal extensively worked from Benwood opposite Belleair to twelve miles north from Wheeling, as well as on both branches of Wheeling creek. As might hardly be expected it shows little variation in character and the following is a representative section:

Coal, 1 ft. 3 in. to 1 ft. 8 in.; clay, 1 ft.; *coal*, 5 to 6 ft.

Rarely a thin shale is found dividing the roof-coal. Eastward the bed disappears about five miles from Wheeling, and at the same distance southward it passes under the Baltimore and Ohio railroad, the dip being southeast. Following the railroad we see the coal again at Fairmont, about eighty miles S. S. E. from Wheeling, dipping sharply to the northwest. Here it is single-bedded, about nine feet thick, and roofed by a heavy felspathic sandstone which is coarse grained and contains numerous coaly spots, evidently eroded coal. The coal from this locality is coked and tests have been made at Wheeling to determine its value in iron-making. It proves to be too impure for use even when mixed with thrice its bulk of Connellsville coke. It is, however, much more compact than that coke, and if it could be cleaned by washing would undoubtedly be employed in preference. Along the base of Laurel Hill (Chestnut Hill, of Pennsylvania Reports), from Fairmont to the junction of Cheat and Monongahela rivers we find the coal always single-bedded and roofed by this coarse sandstone, though occasionally separated from it by a few inches of shale. The roof is very irregular and gives evidence that the eroding current which removed the upper beds, tore out much of the lower coal, which, indeed, near Morgantown is sometimes reduced to six feet, though seldom less than eight.

Crossing the Monongahela we find a number of openings on Scott's Run, which give the following general section:

Coal, 3 in.; shale, 1 ft. 9 in.; *coal*, 1 ft. 3 in; shale, 1 ft. 5 in.; *coal*, 10 ft.

On Courtney's Run, one mile below Scott's Run, we get

Coal, slaty, 1 ft. 9 in.; shale, 3 ft. 5 in.; *coal*, 4½ in.; shale, 1 ft. 10 in.; *coal*, 1 ft. 4 in.; shale, 10 in.; *coal*, 8 ft. 8 in.

On Robinson's Run, one mile farther down, we find

Slaty coal, 2 ft.; black shale, 3 ft. 6 in.; bituminous slate, 10 in.; *coal*, 1 ft. 3 in.; bituminous shale, 1 ft.; *coal*, 8 ft., exposed.

Here, within a distance of six miles, the bed is seen first single-bedded, next, on Scott's Run the roof-coal is present and double, on Courtney's, a third layer is added to the roof, while on Robinson's, the two layers seen on Scott's lie together, though they are clearly distinct.

In Pennsylvania, the character of this bed varies in the different basins, and is found only south of the Ohio and Conemaugh rivers. In the first basin south of those rivers it is about nine feet thick and single; in the second eight and one-half, and single; while in the third it is double with the lower division averaging between nine and ten feet, and the upper varying from two to five and one-half.

RELATIONS OF THE PITTSBURG AND THE SUPERIOR COALS.

It has been stated that *Coals* VIII *a*, VIII *b* and VIII *c* of the Ohio section are to be seen only in the neighborhood of Wheeling and that their relation to *coal* VIII would be considered especially. *Coal* IX, though observable over a much larger area in Ohio is evidently related to VIII in the same manner as the intermediate beds. That the matter may be clearly set forth, the following sections are introduced:—

No. I is from the Central Ohio railroad, eight miles from Belleair.
No. II is from New Egypt, Belmont Co., Ohio.
No. III is from Flushing, Belmont Co., Ohio.
No. IV is from near Cadiz, Harrison Co., Ohio.
No. V is from near York, Jefferson Co., Ohio.
No. VI is from near Unionport, Jefferson Co., Ohio.
No. VII is from Knoxville, Jefferson Co., Ohio (H. Newton).

The section on the railroad is representative of a considerable area and, in all important points, can be duplicated at Belleair and at many localities along Wheeling creek and the Ohio river. The sections obtained here cannot be directly connected with the others given, as high dividing ridges surround the portion of the state represented by Sect. I. The Cadiz section is virtually characteristic of eastern Harrison, but northwest the limestone No. IV becomes thinner as we approach the outcrop.

I.		II.		IV.		VI.	
1. *Coal* X,	—	1. *Coal* X,	—	1. *Coal* X,	—	1. *Coal* X,	?
2. Sandstone,	35'	2. Sandstone,	35'	2. Sandstone,	75'	2. Sandstone,	85'
3. *Coal* IX,	2½'	3. *Coal* IX,	2½'	3. *Coal* IX,	2'	3. *Coal* VIII,	5'
4. Limestone,	70'	4. Limestone,	70'	4. Limestone,	20'		
5. *Coal* VIII *c*,	4'	5. Shales,	5'	5. Shales,	4'		
6. Sandstone,	18'	6. *Coal* VIII,	7'	6. *Coal* VIII,	8'		
7. *Coal* VIII *b*,	1½'						
8. Limestone,	20'	III.		V.		VII.	
9. *Coal* VIII *a*,	1½'	1. *Coal* X,	—	1. *Coal* X,	3'	1. *Coal* X,	1½'
10. Limestone,	20'	2. Sandstone,	60'	2. Sandstone,	85'	2. Sandstone and shale,	100'
11. Shale,	5'	3. *Coal* IX,	—	3. *Coal* IX,	1½'	3. *Coal* VIII	—
12. *Coal* VIII,	8'	4. Limestone,	38'	4. Limestone and shale	7'		
		5. Shales,	4'	5. *Coal* VIII,	6½'		
		6. *Coal* VIII,	6'				

Should one follow Wheeling creek, Ohio, from its mouth to where it becomes Patterson's creek, he will find VIII *c* in its banks, as well as in those of its tributaries. Along the bottoms of Patterson's creek, which flows northeast, he will see it worked by stripping. But before reaching Union township the creek bed is some distance above it. Crossing the dividing ridge and descending into the valley of Spencer's creek, he will find Section II, six miles west of the locality where he last saw VIII *c*. If, however, instead of following Patterson's creek, he take the branch flowing from the northwest, he will lose sight of VIII *c* near Uniontown, and six miles further he will obtain Section III. The result is similar in other directions. In each of these sections a coal is seen one hundred feet, more or less, below *Coal* X. In No. I it is VIII *c*, in the others it is VIII. The accuracy of this identification has been questioned, so that the grounds on which it is made should be stated distinctly.

Ascending the Central Ohio railroad from Belleair to the summit, twenty-two miles west from the Ohio river, nine beds of coal are seen, beginning with the Pittsburg (VIII).

Descending from the summit to Quaker City, thirty-five miles west from the river, only six can be seen, and at Quaker City the *crinoidal limestone* occurs. The relation of the sections is as follows :—

ASCENDING.		DESCENDING.	
1. *Coal* XIII.		1. *Coal* XIII.	
2. Shales and sandstone,	70	2. Shale and Sandstone,	70′
3. *Coal* XII.		3. *Coal* XII.	
4. Shaly sandstone,	40′	4. Shale and Sandstone,	30′
5. *Coal* XI.		5. *Coal* XI.	
6. Sandstone and shales,	98′	6. Sandstones with thin limestones and shales,	100′
7. *Coal* X.		7. *Coal* X.	
8. Sandstone,	35′	8. Sandstone,	60′
9. *Coal* IX.		9. *Coal* IX.	
10. Limestone,	70′	10. Limestone,	5½′
11. *Coal* VIII *c*.		11. Sandstone,	45′
12. Sandstone,	18–35′	12. *Coal* VIII.	
13. *Coal* VIII *b*.		13. Fireclay,	5′
14. Limestone,	20′	14. Limestone,	4½′
15. *Coal* VIII *a*.		15. Sandstones and variegated shales,	150′
16. Limestone,	20–25′	16. *Crinoidal Limestone.*	
17. Shales,	5–10′		
18. *Coal* VIII,			
19. Fireclay and shales with thin limestone.	10′		
20. Sandstone,	90′		

It is evident from these sections, that east and west of the summit the strata are identical to No. 10 of each, including, as was previously shown, No. 11 of the second; and it is equally evident that No. 12 of the second cannot be No. 11 of the first, but that it must be *Coal* VIII or the *Pittsburg*. The internal anatomy of the bed shows this, for even along the Central Ohio railroad, where the upper division has been removed, we find the characteristic pyrites band and the clay partings. But in order to remove all possible doubt, the

Coal VIII of the second section was carefully traced with its *crinoidal limestone* along its western and northern outcrop, from Salesville, in Guernsey Co., to the Ohio river at Steubenville. From Steubenville it was easily followed down the river to Belleair, where it was found to be identical with *Coal* VIII of the first section. It is clear, then, that the coals between VIII and IX have disappeared somewhere within the dividing ridges of Belmont Co. One would expect to find the successive disappearances along the Ohio, but the coals become very thin above Belleair and the superficial deposits are so thick that accurate tracing is impossible.

It is well to note that wherever VIII *c.* occurs, it has the same relative position to *Coal* X that *Coal* VIII holds west and north of the dividing ridges in Belmont Co., the interval in each case being about one hundred feet.

The gradual disappearance of the limestone below *Coal* IX and the merging of that coal into *Coal* VIII are more easily traced. In Section I on the Central Ohio railroad the limestone is seventy feet; at Barnesville the interval, including the shales and upper layers of *Coal* VIII, is only forty-five feet; at New Egypt, considerably east of Barnesville, it is seventy feet; at Flushing, north from Egypt, it is thirty-eight; at Cadiz, northeast from Flushing, it is only twenty feet, and diminishes rapidly to the northwest, being only five feet at Hanover; at York it is seven feet, including the shales, overlying VIII; while at Unionport and Knoxville the limestone does not exist and *Coal* IX itself has disappeared. From a careful study of these facts I am led to believe that here we have a series of bifurcations of *Coal* VIII almost as extensive and interesting as those said to occur in the *Mammoth* bed of the anthracite region. It is worthy of note in this connection that the distance between *Coals* VIII and X gradually diminishes northward, from one hundred and five feet on the Central Ohio railroad to eighty-five feet at Unionport, and the interval between X and XI diminishes in the same direction from one hundred feet on the railroad to sixty feet at York. Under these circumstances I am inclined to look upon the thin coal, one hundred feet above *Coal* VIII at Knoxville as XI and not X. Thinning out northward, like the lower coals, as these beds do, and gradually nearing *Coal* VIII, it is more than probable that they in like manner were successively merged into *Coal* VIII, which I regard as the parent bed of all the upper coals in Ohio, remaining in existence as a flourishing swamp from the beginning of the epoch until its close.

A similar condition seems to have existed on the eastern shore of the inland sea, though it is somewhat difficult to obtain thoroughly satisfactory evidence, owing to the peculiar manner in which information is scattered through the Pennsylvania report. Three short sections have been taken from that report, one from each of the three basins south of the Ohio.

3D BASIN, REDSTONE CREEK.		2D BASIN, LIGONIER.		1ST BASIN. ELK LICK.	
1. *Sewickly Coal* (VIII *b*),	4'	1. *Sewickly Coal* (VIII *b*),	3'	1. *Sewickly Coal* (VIII *b*),	?
2. Shale,	2'	2. Not seen,	5'	2. Sandstone,	25'
3. Limestone,	6	3. Limestone,	6'	3. Shale,	15'
4. Shale,	40	4. Shale,	10'	4. *Pittsburg Coal* (VIII),	9'
5. *Redstone Coal* (VIII *a*),	2½'	5. *Redstone Coal* (VIII *a*),	3'		
6. Shales and sandstone,	35'	6. Shales,	20'		
7. *Pittsburg Coal* (VIII),	14'	7. *Pittsburg Coal* (VIII),	8½'		

CONDITIONS DURING DEPOSITION OF THE UPPER COAL MEASURES.

To many it may appear that the data presented in this paper are insufficient to justify generalization respecting the conditions prevailing during the epoch of the upper coal measures. But let it be remembered that the portion of the field examined is by far the most important economically and by far the most satisfactory in the exhibition of details.

South from the railroad line bounding our observations, the greater portion of the section, which we have been discussing, disappears and the only information to be obtained respecting it is found along the line of outcrop on the west, or on the steep mountain slopes on the east. In no other portion of the basin can details be obtained respecting the strata below the *Waynesburg coal.* To give a fair illustration I have introduced for comparison four sections from the east side of the basin and four from the west side as follows:

I from Wheeling.
II from Barnesville, Ohio.
III from near Georgetown, Ohio.
IV from near York, Ohio.
V from Ligonier, Penn. (Rogers).
VI from Monongalia Co., West Virginia.
VII from Uniontown, Penn. (Rogers).
VIII from Elk Lick, Penn. (Rogers).

I.		I.		I.	
1. *Waynesburg Coal* (XI),	3	12. Shale,	3'	23. *Coal*,	1¼'
2. Shale,	33	13. Limestone and Shale,	13'	24. Sandstone, } VIII *c*,	6'
3. Limestone,	15	14. Shale,	6'	25. *Coal*,	1
4. Sandstone,	3'	15. Limestone,	2'	26. Sandstone,	8-24'
5. Limestone,	5'	16. Shale,	4'	27. *Sewickly Coal* (VIII *b*),	1⅜'
6. Shale,	5'	17. Limestone,	3½'	28. Limestone,	24'
7. Limestone,	2'	18. Shale,	3'	29. *Redstone Coal* (VIII *a*),	1'
8. Shale,	2'	19. Limestone,	1'	30. Limestone,	20'
9. Limestone and Shale,	11'	20. Shale,	3'	31. Shale,	6'
10. Shale,	5'	21. Limestone and Shale	19½'	32. *Pittsburg Coal* (VIII),	8'
11. Limestone,	4½'	22. Shale,	3'		

II.		II.		II.	
1. *Waynesburg Coal* (XI)	½-5'	5. *Coal* X,	4'	9. Sandstone,	40'
2. Sandstone and Shale,	50'	6 Sandstone,	55'	10. *Pittsburg Coal* (VIII)	4'
3. Limestone,	6'	7. *Coal* IX,	1⅜'		
4. Sandstone and Shale,	45'	8. Limestone,	5½'		

III.	
1. *Waynesburg Coal* (XI),	2'
2. Shale,	5'
3. Limestone,	10'
4. Sandstone,	20'
5. Limestone,	10'
6. Sandstone,	25'
7. Limestone,	7'
8. Sandstone,	8'
9. Shale,	6'
10. *Coal* X,	4½'
11. Shale,	10'
12. Sandstone,	55'
13. *Coal* IX,	2½'
14. Limestone,	25'
15. Shale,	6'
16. *Pittsburg Coal* (VIII),	7-8'

IV.	
1. *Waynesburg Coal* (IX),	?
2. Shale and Sandstone, with Limestone nodules,	60'
3. *Coal* X,	3'
4. Sandstone and Shale,	85'
5. *Coal* IX,	1½'
6. Shale with thin limestone,	10'
7. *Pittsburg Coal* (VIII),	6½

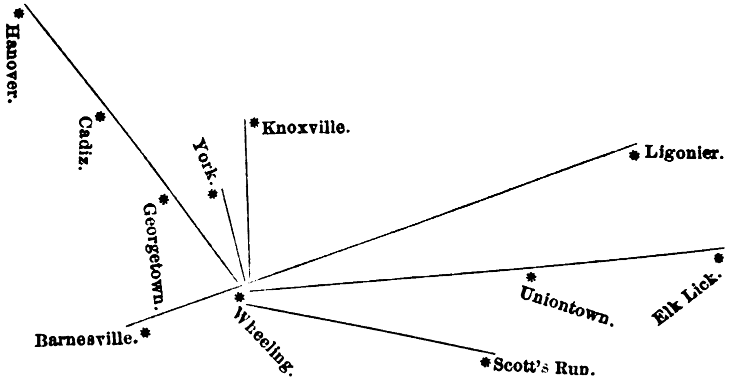
V.	
1. *Coal* (*Uniontown?*) (X ?)	?
2. Not seen,	10'
3. Limestone,	7'
4. Sandstone,	35'
5. *Sewickly Coal* (VIII *b*),	3'
6. Not seen,	5'
7. Limestone,	4-8'
8. Shale,	10'
9. *Redstone Coal* (VIII *a*),	3'
10. Shale,	20'
11. *Pittsburg Coal* (VIII),	8½'

VI.	
1. *Waynesburg Coal* (XI),	9'
2. Sandstone,	15'
3. Shale,	8'
4. Limestone,	5'
5. Shale,	4'
6. Sandstone,	15'
7. Limestone,	30'
8. Sandstone,	25'
9. Limestone,	6'
10. Sandstone,	15'
11. Limestone,	7'
12. Sandstone,	10'
13. Limestone,	8'
14. Shale,	12'
15. Sandstone,	31
16. *Sewickly Coal*,	5'
17. Shale,	8'
18. Limestone,	7'
19. Sandstone,	10'
20. Limestone,	22'
21. *Redstone Coal*,	4'
22. Limestone,	12'
23. Shale,	8'
24. *Pittsburg Coal*,	14'

VII.	
1. Limestone,	12'
2. Limestone, sandstone and shale,	?
3. Shale,	15'
4. Sandstone and some limestone,	110' ?
5. *Sewickly Coal*,	4½'
6. Shale,	2'
7. Limestone,	6'
8. Shale,	40'
9. *Redstone Coal*,	1-2½'
10. Shale with calcareous nodules,	15'
11. Sandstone,	5'
12. Shale,	15'
13. *Pittsburg Coal*,	14'

VIII.	
1. *Coal*,	?
2. Sandstone,	50'
3. *Sewickly Coal*,	?
4. Sandstone,	25'
5. Shale,	15'
6. *Pittsburg Coal*,	9'

The relative geographical positions of these localities, as well as those of some others already referred to, are shown in the following diagram.



A similar series of sections of the Barren measures shows that the strata of that group diminish in thickness east and west of the central portion of the basin. There can be no doubt, therefore, that at the beginning of the Barren epoch, the Alleghany basin had already its present shape and was bounded on the west by the slopes of the Cincinnati axis, on the east by the slopes of a similar axis. The events of the succeeding epoch seem to show that the Cincinnati axis had attained its highest elevation before the deposition of the upper coal measures began. At the close of the Barren epoch, the northern portion of the basin was a half-filled valley such as is now presented by the bed of the Ohio river, below Smith's Ferry.

A comparison of the upper coal measure sections given above, shows that as we leave the middle of the basin we find the limestones diminishing in every direction. In the portion below *Coal* X, these limestones, followed west and north do not give place to off-shore deposits, but simply disappear and permit the coal-beds to approach each other; whereas, eastward, they interlock with sandstones and shales, before disappearing, which in their turn thin out as do the limestones on the west side of the basin. This is evidence of clear, quiet waters on the west, while rivers or shore currents carried in their freight of sand and mud from the east and northeast.

After the formation of *Coal* X, which, as has been stated, may have been synchronous with the *Uniontown* of Pennsylvania, the conditions were more nearly alike throughout the basin until the formation of the *Waynesburg*, though at the east and west, alternations of limestone and sandstone during the greater portion of the interval give evidence of neighboring shores. The limestone is still greatest in the central portions, but is easily traceable in strata or nodules as far west as Barnesville, north as Unionport, and east as Elk Lick creek, all on the line of final outcrop.

On the west side of the basin, we find the Redstone, Sewickly, VIII *c* and IX successively merged into the Pittsburg. On the east side we find the Redstone disappearing and the Sewickly brought nearer to the Pittsburg by so much as the Redstone was distant from it, while the interval between the Sewickly and the Uniontown (X ?) is reduced at the most easterly exposure to barely one-third of what it is nearer the central portion, on the Monongahela. We have thus evidence of a series of gradual subsidences, separated by intervals of repose, during each of which a lid of coal was formed over all or a part of the basin. These subsidences could not have been paroxysmal, for we find that as the shore-line sank, the great Pittsburg marsh crept up the shore, continually from the beginning of the epoch until long after the formation of *Coal* IX, perhaps until the very close of the epoch. Thus it is that, although giving origin to so many subordinate seams, the great coal bed diminishes in thickness when followed west from the Ohio, or east from the immediate valley of the Monongahela.

It is highly probable that the *Pittsburg* was begun on the east and advanced westwardly. We have ample evidence in the sandstone and shale, which at the east separate it from its limestone, that a delta was there forming and pushing out to the west, so that on the east the conditions requisite for the formation of coal would first exist. On the east side of the basin we find nine to ten feet in the lower division of the bed, while on the west side we find only five to six feet.

I am led, then, to the following conclusions:

1. The Great Bituminous Trough, west of the Alleghanies, does not owe its basin shape primarily to the Appalachian Revolution.
2. The coal measures of this basin were not united to those of Indiana and Illinois at any time posterior to the lower coal measure epoch, and probably were always distinct.
3. The upper coal measures originally extended as far west as the Muskingum River, in Ohio.
4. Throughout the upper coal measure epoch the general condition was one of subsidence interrupted by longer or shorter intervals of repose. During subsidence the *Pittsburg* marsh crept up the shore, and at each of the longer intervals of repose pushed out seaward upon the advancing land, thus giving rise to the successive coal-beds of the upper coal measures.
5. The *Pittsburg* marsh had its origin at the east.

XXI. — *On the Lingual Dentition of Gæotis.*

BY THOS. BLAND AND W. G. BINNEY.

Read January 6, 1873.

THE genus *Gæotis* was described by Shuttleworth,* founded on a curious mollusk from Porto Rico. The lingual dentition was said to be nearly the same as in *Vitrina* and *Zonites*, the teeth arranged in oblique rows, centrals obtusely tridentate, laterals scarcely differing from the centrals, marginals lengthened, awl-shaped, arcuate, at base ? bifurcate. The presence of a jaw was not verified by Shuttleworth. The character of the dentition was considered such as to denote carnivorous habits of the animal.

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* "Lamina lingualis fere ut in *Vitrina* et *Zonites* constituta videtur, papillæ nempe numerosæ in seriebus utrinque obliquis ordinatæ sunt: papilla centrali obtuse tri dentata; mediis vix a centrali diversis; lateralibus autem subulato-productis, arcuatis' basi? bifurcatis. An maxilla adsit hæret." "E formatione linguæ animal videtur sine dubio carnivorum." Shuttleworth, Bern Mit. 1854, p. 34.

This is all the information as to the lingual dentition of *Gœotis* hitherto published. Mörch, indeed, places the genus (Jour. de Conch. 1865, 384) in his section *Odontognatha*, which comprises the Terrestrial Pulmonata furnished with a ribbed jaw, not from any original investigations, but simply from its assumed identity with *Parmacella*, a genus believed to have a ribbed jaw, judging from the obscure figure given by Férussac of the mouth of *Parmacella palliolum* (Hist. t. 8 A, fig. 8). Shuttleworth's description rather indicates the form of dentition figured by us (Land and Fresh Water Shells, I), of many species of *Vitrina*, *Hyalina* and *Zonites*. The bifurcated base of the marginal teeth may even be supposed to be such as we have figured (*l. c.* 17) in the centrals of *Glandina truncata*.

We have long had in our possession the jaw and lingual membrane of a specimen of *Gœotis* from Porto Rico. The animal was received many years ago by one of us (Bland) from the late Mr. Robert Swift, the alcohol in which it was originally preserved evaporated, and the jaw and lingual membrane were, not very long since obtained, by maceration, in a somewhat imperfect condition. Comparing the latter with Shuttleworth's description, we find that at first we had misunderstood his words, which, indeed, are quite liable to mislead, especially in the infelicitous comparison with *Vitrina* and *Zonites*. We give, therefore, a more detailed description and figure, in order to prevent further errors.

Jaw (plate xi, fig. 1) long, low, slightly arcuate, ends attenuated, extremely thin and delicate, transparent: in one single piece, but divided by over forty* delicate ribs into as many plate-like compartments of the type common in *Bulimulus* and *Cylindrella*, but without the upper median triangular plate characteristic of the latter; both margins scarcely serrated by the ends of the ribs.

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* Fragments only of the jaw were saved; the largest one we have figured, and from it estimate the whole number of ribs.

From our numerous observations on the jaws of *Pulmonata* (see Ann. Lyc. N. H. of N. Y., X, 165), we consider this to be a form of ribbed jaw, the plate-like sections being actually divided by delicate longitudinal ribs. It is to be understood that the jaw is not in separate pieces, as in *Orthalicus* and *Liguus* (see Ibid, p. 168). Our figure of the jaw of *Helix turbiniformis*, Pfr. (Ibid, pl. ii, fig. 2), gives the same type of jaw, though differing in form. That of *Succinea ? appendiculata* (Ibid, X, pl. ix, fig. 2) is still nearer the jaw we are considering.

The lingual membrane is entirely different from what we had supposed from our interpretation of Shuttleworth's description. We recognize no resemblance to that of *Zonites* and *Vitrina*, but rather (in arrangement and shape of teeth and position of cusp) to that figured by us of *Orthalicus zebra* and *undatus* (Amer. Jour. of Conch. 1870, pl. ix, figs. 2, 6, 10, 12,) and *Liguus fasciatus* drawn by Leidy, (Terr. Moll. U. S. II, 270). From these, however, it differs in the development of its cusp, which shares the trifid character, and nearly resembles that of *Helix muscarum* (Am. Jour. Conch. *l. c.* fig. 4).

Lingual membrane long and broad, composed of numerous rows of teeth arranged *en chevron*. Centrals very long, narrow, obtuse above, incurved at sides, obtusely rounded and expanded at base near which is a short, gouge-shaped, expanded cusp, whose lower edge is bluntly tridentate. Laterals same as centrals in shape, but a little larger, and unsymmetrical from the disproportionate expansion of the outer denticle of the cusp. Marginals same as laterals, but more slender, with more developed and graceful teeth, of which the median is pointed, often bifid. There is much variety in the shape and denticulation of the cusps. The middle denticle is always the smallest.

We find no distinct marginal teeth of the aculeate type noticed by Shuttleworth, but believe he was misled by seeing these teeth in exact profile, when they have somewhat that form as shown in our figure 6. Seen from above, however, the same teeth retain their subquadrate form, figure 7. Both jaw and lingual membrane, therefore, prove that the genus belongs to the *Helicinæ* of our proposed arrangement of Pulmonata (see Ann. Lyc. N. H. of N. Y., *l. c.* 165), or to the *Helicea* of von Martens. (Die Heliceen, ed. 2.)

By its jaw, *Gæotis* calls to our mind the genus *Amphibulima* (see pl. xi, fig. 8), as well as the shell known as *Succinea? appendiculata* Pfr., whose generic position we have left in doubt (Ibid, X, pl. ix, fig. 2), and many species of *Bulimulus*. We have above shown the resemblance of its lingual dentition to that of *Orthalicus* and *Liguus*, as well as of *Helix muscarum*. It also forcibly reminds one of some of the features of the dentition of *Triboniophorus*.

Our figure 5, plate xi, gives the central and adjacent lateral teeth: fig. 6 an extreme marginal in profile, on a different scale of enlargement: fig. 7 a marginal seen as in fig. 6: fig. 1 the largest fragment saved of the jaw.

XXII.—*Note on a curious form of Lingual Dentition in Physa.*

BY THOS. BLAND AND W. G. BINNEY.

Read January 6, 1873.

We have received from Governor Rawson specimens in alcohol of a shell apparently belonging to the genus *Physa*, collected at Point á Pitre by M. Schramm. On examining its jaw and lingual dentition, we find both different from what is usual in that genus. The jaw is not at all chevron-shaped,* but is simply slightly arcuate, long, low, ends attenuated. The lingual membrane wants entirely the broad transverse rows of comb-like teeth arranged *en chevron* which are characteristic of *Physa.*[*] On the other hand, the lingual membrane is long and narrow, with almost horizontal rows of teeth. The centrals are narrow, somewhat expanded at the base, at apex recurved into a slightly produced quinquedentate cusp, the central denticle the largest. The laterals are quadrate, the whole apex recurved into a broad cusp produced almost to the base of the tooth, with one large, inner, stout, pointed denticle which bears on its inner side another small pointed denticle, and two, small, irregular, sharp, side denticles. The marginals are but modifications of the laterals, wider than high, with one bluntly bifid inner, and several small, blunt, irregular side denticles.

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* See figure of jaw of *Physa* in Land and Fresh Water Shells of North America, II, p. 75, fig. 123.

The centrals and laterals are like those of *Limnæa*[†] rather than of *Physa*, the marginals more like those of *Planorbis*[‡] but much more quadrate.

In our figure 2 of plate xi, we give one central and several lateral teeth, in fig. 3 one marginal: fig. 4 represents the jaw.

A view of the shell is also given in fig. 9.

We have not been able to determine this species of *Physa*, represented by M. Schramm to be very rare. In some respects it appears to be allied to *P. striata* D'Orb. (Cuba I. 192, Tab. xiii, figs. 14–16), received by that author from M. Ferdinand de Candé, but whether from Martinique or Cuba was not positively known.

EXPLANATION OF PLATE XI.

Fig. 1. A portion of jaw of *Gæotis* (p. 253.)
2. Physa ——? (See p. 255.) One central tooth and two laterals from the lingual membrane.
3. The same as 2. One marginal tooth.
4. The same. The jaw.

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[*] See Ibid, p. 81, fig. 138: p. 82, fig. 141. *Physa ampullacea*, Gld. from Colorado Territory, lately collected by Dr. E. Palmer, has the same type of lingual. Dall has detected a more simple form of tooth alternating with the comb-like laterals of *Physa*. See his exhaustive review of *Limnæidæ* etc., in Ann. of Lyc. N. H. of N. Y., IX, 333, for valuable information on the dentition of the fresh water Pulmonates.

[†] See our figures in the Amer. Jour. of Conch., 1871, pl. xii.

[‡] See our figure in Ann. of Lyc. N. H. of N. Y., IX, p. 292.

Fig. 5. Lingual dentition of *Gæotis*. One central tooth with adjacent laterals.
6. Same as last, but more enlarged An extreme marginal tooth in profile.
7. Same as 5. An extreme marginal tooth.
8. *Amphibulima patula* (see p. 225.) The jaw folded as it appears on the microscope slide, the position taken from its extreme tenuity.
9. Physa sp. indet. Shell. Jaw and Lingual dentition. Figs. 2-4.

XXIII.—*Catalogue of the Pyralidæ of California, with descriptions of new Californian Pterophoridæ.*

BY A. S. PACKARD, JR.

Read January 6, 1873.

THIS catalogue of the Pyralid moths of the Pacific states is published more to show how extremely limited is our present knowledge of this family, as regards the region west of the Rocky Mountains, than to give a view of the group as developed in that part of the world. Neither Guenée in his "Histoire Naturelle des Insects, Species général des Lépidoptères," Tome VIII, Deltoides et Pyralites (1854), nor Boisduval* in his writings on the Lepidoptera of California, mention any species of this family, and it is believed that, with the exception of *Botys fodinalis*, described by Mr. Lederer from California, the following descriptions are the first references to the California species of this interesting group.

For my material I am chiefly indebted to Mr. Henry Edwards, of San Francisco, to whose energy in collecting, the science of entomology is under so many obligations. A few specimens have been received from Mr. Junius Holleman of Goose Lake, near Fort Bidwell, Siskiyou County, Cal.

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* Lépidoptéres de la Californie (Annales Soc. Ent. France, Sér. 2, 1852, Tome 10, p. 275-324; sèr. 3, 1855, Tome 3). Bull. p. 31.
See also Annals Soc. Ent. Belgique, Tome xii, 5, 1869.

Among those he sent are some extremely interesting Crambus-like forms, one with pectinated antennæ, too imperfectly preserved for description, but sufficiently so to indicate some remarkable types of this group of the family. Several interesting forms have been received from Mr. James Behrings.

An interesting fact in geographical distribution is the considerable extension given to the range of one of the probably cosmopolitan species of moths. I refer to the *Nomophila noctuella* (Schiff.). It has hitherto been reported by Guenée from different parts of Europe, Algeria, Caffraria, Bengal, Pondicherry, Brazil, and Philadelphia. It has also been known by myself to occur in New England and New York, and now it has been received from Oregon, near the Californian state boundary line, from Siskiyou Co., California, near the Oregon line, and from the vicinity of San Francisco. Occurring so far inland as the settlements about Fort Bidwell, Siskiyou County, and also the newly settled portions of Oregon, it may be inferred that this species has not been introduced by man, and that it is probably autochthonous where it has been observed, at least in America. A variable moth wherever it occurs, it varies in much the same manner in California as in Europe. Such cosmopolitan forms give rise to the suspicion that they are relics of a preceding geologic age, which is borne out by the fact that quite a gap separates it from its nearest allies.

Another point of interest is to ascertain what European features occur in the few species yet known of this family. The assemblage, so far as our rather scanty knowledge of this group may be depended upon, is allied as closely to the fauna of eastern North America as to Europe, as seen in the species of Botys and Cataclysta. In the group of Pterophoridæ one species quite unlike any European one, so far as I am aware, has a very close ally in New England.

In the measurements hundredths of an inch are used, and instead of indicating the alar expanse, the length of one fore wing is given to secure greater exactitude.

Pempelia fenestrella, n. sp.—2♂ 4♀. In this species the fore wings are long and rather narrower than in the European *P. palumbella*, and the large, broad palpi, though of much the same form, are porrected instead of ascending; but in venation and the structure of the antennæ it agrees with the European species, and *Pempelia ovalis* from New England, in which the wings are much shorter. Body and wings cinereous, or granite-gray, the abdomen and legs being paler, and concolorous with the legs and hind wings, which are of the usual glistening hue of the genus. Fore wings of the same ash hue as the thorax, speckled with black scales. Two black dots at the base of the wing below the median vein. Beyond on the submedian vein is a longitudinal, blackish, inconspicuous stripe edged on each side with dull ochreous. Above it is a dark point on the median and subcostal veins, with whitish scales surrounding the middle dot, but there are no raised scales on the wing. Just beyond the middle of the wing are two, prominent, squarish, black spots, one on the median the other on the subcostal vein. A distinct, white, submarginal line, parallel with the outer edge and bordered internally with black scales, especially marked on the costa. The space between this line and the outer edge is filled in with deep, ochreous, longitudinal bars, alternating with black streaks, of which the costal one is the widest and shortest. These bars do not quite reach the distinct, black line at the edge. Fringe ash, twice lineated with whitish. Beneath a pale, whitish, straight, submarginal line, edged within towards the costa with dark ash.

Length of body ♂, ·45, ♀, ·45 of an inch; fore wing ♂, ·43, ♀, ·44 of an inch. California (Edwards).

Easily recognized by the very distinct, yellow and black bars; the prominent, twin, squarish spots, and the distinct, white, once sinuate, whitish, submarginal line.

Pempelia leoninella, n. sp.—2♂ 1♀. Antennæ and palpi as in *P. fenestrella*, but the fore wings are more produced towards the apex, the outer edge being more oblique. Body and base of fore wings tawny, the thorax being clay-yellow; palpi clear ash. Basal third of fore wings tawny yellow, somewhat orange colored externally, outer edge of this colored portion directed regularly, obliquely outwards from the costa to the inner edge, with three, black, venular dots along this oblique border. In the ash space beyond is a distinct, dark, discal dot, and the veins are black. A broad, marginal, tawny yellow band, the sides even and parallel; the costa, however, is cinereous to the apex. A marginal black line, and a fine dark line in the cinereous fringe near the base. Hind wings of the usual hue. Abdomen luteous. Beneath fore wings smoky, dusky towards the costa; a pale, costal streak, not forming a submarginal, pale line as in *P. fenestrella*. Legs dark ashen, whitish at ends of joints.

Length of body ♂, ·50, ♀, ·45 of an inch; of fore wing ♂, ·46, ♀, ·45 of an inch. California (Edwards).

Differs from *P. fenestrella* in the more acute primaries, the tawny base of the wings and the conspicuous, marginal, broad, tawny band, and the want of the twin squarish spots in the middle of the wing.

Nomophila noctuella (Schiff.) (*Stenopteryx hybridalis* Hübn.) After comparing four specimens from Oregon (collected by Mr. J. Holleman) and ten from California (coll. Edwards) with one from New York (Angus) and three from New England, and four from Europe, I can find no valid differences. The largest suite, from California, vary in the same manner as in the European specimens. One form is dark with the markings very distinct, the other is paler, with the discal dot and reniform spot partially obsolete, and the lines indistinct, while the whole moth is somewhat tawny. The variation in size is much as in the European specimens. One specimen was collected by Mr. J. Holleman in Siskiyou Co., Cal.

Scopula occidentalis, n. sp.—2♂ 2♀. In this species the outer edge of the fore wings is much more oblique, and the costa much more rounded at the apex than in the European *S. inquinatalis*, otherwise structurally it is closely allied. Stone gray; head and palpi gray; orbits white; head and palpi white beneath. Fore wings uniform stone gray, crossed by two, distinct, wavy, dark lines; inner line shaded with whitish internally, with a large angle projecting outwards just below the median vein, and another inwards on the submedian. Discal and reniform spots very distinct, black. Outer line finely scalloped, curved outwards from the costa to the fourth median venule, where the line forms a sinus, and angulated outwards on the submedian vein; the line broadly shaded externally with whitish. A marginal row of black dots. Fringe concolorous with the wing. Hind wings dusky, fringe pale; an obscure, short, dusky line beyond the middle. Beneath, much paler than above, dot and reniform line distinct, outer line faintly reproduced, as also the marginal dots. A short, faint line on hind wings. Abdomen dark above. Legs whitish.

Length of body ♂, ·44, ♀, ·40 of an inch; of fore wing ♂, ·44, ♀, ·42 of an inch. California (Edwards and Behrens).

The lines and spots are very distinct on the fore wings, and in some specimens the space between the two lines is slightly darker than the rest of the wing.

Botys Californicalis, n. sp.—1 ♂. This species belongs to the Rhodaria group, having broad, triangular, acute palpi, and being of small size, with the hind tibiæ rather swollen. Body and wings light brick red, with a deep, ochreous tinge. Orbits white, becoming red towards the front, palpi grayish-red, white along the under edge; head beneath white. Fore wings ochreous red, a basal, fine, regularly curved, waved dark line; an outer, similar line, straight on the costa and inner edge, curved outwards and wavy between the subcostal vein and fourth median venule, there being four distinct scallops in this curved portion. Edge of wing broadly margined with dull, leaden, reddish-brown; fringe reddish-brown on basal half, much paler beyond. Hind wings marked much as primaries, being reddish, and bordered widely with dull, leaden, reddish-brown; base of wing powdered with dark scales, and the outer, curved, dark line present, diffusely shaded within. Beneath, paler than above, a large, dark, discal patch; costal and outer margin of wing dull, leaden brown; hind wings with a conspicuous, single, definite line, not shaded within, outer edge bordered widely with dusky brown. Fringe as in primaries. Abdomen reddish, with whitish, conspicuous lines covering hinder edge.

Length of body ?; of fore wing, ·28 of an inch. California (Edwards).

Botys unifascialis, n. sp.—2♂. Of an uniform, stone-gray color, with a dark olive greenish hue. Head and thorax rather darker than the fore wings. The only mark on the fore wings is a submarginal, broad, sinuous diffuse, pale band, which is curved outwards on the upper half and inwards on the lower. Fringe concolorous with the wings. Hind wings paler than primaries, with a slightly marked, median, broad, diffuse band; near edge of wing whitish; extreme edge gray. Fringe white. Beneath fore wings dusky with no markings, but paler on the inner, outer and costal edges. Hind wings cream white. Fore legs slightly grayish; hind legs white.

Length of body, ·55 of an inch; of fore wing, ·55 of an inch. California (Edwards).

This species very closely resembles an eastern species,* but differs in the pale band on the hind wings, while both pairs are rather more acute on the apex.

Botys profundalis, n. sp.—2♂ 3♀. This is a small form, with the apex of fore wings subacute, rectangular, the outer edge being less oblique than in any other of the species described, while the palpi are rather longer and larger. Orbits white on vertex and on each side of the antennæ. Deep ochreous-brown, body white beneath; palpi light brown, white on the under side. Fore wings deep ochreous-brown; the inner line angulated outwards broadly on the median vein and inwards on the submedian. A large, round, discal dot and dumb-bell-shaped, reniform spot, these spots more conspicuous than usual. The outer line is dark filiform, oblique, with its general course parallel with the outer edge, but inwards making an elbow just below the costa, while just below the median vein, the line is deeply curved in, making a very deep sinus, with parallel sides, the bottom of the sinus being parallel with the inner edge of the reniform spot. A marginal row of conspicuous, black dots. Fringe ash color, with a dusky line at the base. Hind wings pale, the discal dot small, inconspicuous; the outer line with a small, deep sinus behind the middle of the wing, the line much curved in front of this sinus. A row of black dots along the edge. Beneath pale, with the lines and spots very distinctly reproduced, the fore wings not dusky as usual in some specimens. Legs whitish.

**Botys subolivalis*, n. sp. This species belongs to a distinct group, as far as I can judge by the figures, apparently including the European *Botys alpinalis* and its variety *ablutalis* figured by Herrich Schaeffer in his "Systematische Bearbeitung der Schmetterlinge von Europa," etc. The fore wings are rather broad, subtriangular, costa straight, rounded towards the apex; outer edge not very oblique; hind wings broader than usual. It is of a peculiar stone gray, with a slight olive-green tinge. There are no markings on the fore wings, except a faint pale sinuate broad shade crossing the outer third of the wing; it is directed outwards on the costa, curved outwards in the middle of the wing, and is straight below the 4th median venule. Fringe slightly darker than the wing. Hind wings dark smoky; fringe whitish, smoky at base. Beneath clear smoky ash on the fore wings, white on the hind wings, with a single broad diffuse, much curved, dark band in the middle, and slightly dusted with cinereous scales near the outer edge. Length of body ·40 of an inch; of fore wing ·50 of an inch. Brunswick, Maine, in grass uplands; Orono, Maine, July (Packard). It cannot be confounded with any other species of Botys I have yet seen.

Length of body ♂, ·42, ♀, ·40–·45 of an inch; of fore wing ♂, ·42, ♀, ·40–·46 of an inch. California (Edwards).

This apparently common species may at once be known by the unusually deep sinus of the outer line. All the lines and spots are very distinct, especially on the hind wings. One female, the best preserved of the lot, is bright florid ochreous, while the best preserved male is of a pale mouse color, and the fore wings are dusky beneath.

Botys mustelinalis, n. sp.—2 ♀. Body rather stout, with the fore wings rather narrow, much produced towards the apex, the outer edge being a little more oblique than usual. Body and wings of a uniform, pale, cloudy, sable-brown. Orbits just in front of the antennæ and upper side of the palpi whitish. Fore wings with an oblique, dusky line, extending from the costa outwards to the inner edge, being curved outwards a little in the median space, and inwards slightly on the submedian space. An obscure, dusky, large, round, discal spot and large reniform spot. Outer dusky line finely scalloped, curved around gradually from the costa to the fourth median venule, where it is bent at right angles inwards, and the lower, wider, dusky portion begins half way between the end of the upper, scalloped division, and the origin of the fourth median venule; this portion is twice waved. Outer edge of wing a little darker than the middle and the costa is also darker. Hind wings slightly paler than primaries. A faint, discal dot, and an outer dusky shade, dislocated, or rather with a deep sinus below the middle of the wing. A marginal, fine, dark line. Fringe concolorous with the wing. Abdominal segments edged with whitish. Beneath, somewhat paler with the discal and reniform spots faintly reproduced; the outer line appears as a finely, deeply scalloped line, the scallops filled in with a much paler tint; the border of the wing is finely dusted with fine, grayish scales; fringe with a slightly marked, fine, median, pale line. Hind wings with an acutely zigzag, outer line, and a short, dusky, diffuse line in the middle of the wing, not reaching the costa or hind edge. Body beneath and legs paler, almost whitish.

Length of body, ·50 of an inch; of fore wing, ·50 of an inch. California (Edwards).

The distinguishing marks of this dull colored species is the rectangularly bent, outer, dusky, scalloped line, forming a large, reëntering angle just under the reniform spot; the apex of the fore wings is also rather more produced than usual.

Botys fodinalis Lederer—2♂ 1♀. This is a species of the typical form of the genus, with the fore wings moderately broad, the apex subacute, the outer edge not very oblique. Head, thorax and fore wings pale sable-brown. Palpi entirely sable-brown; orbits in front of antennæ white. Fore wings with a faint, dark, basal line, incurved on the subcostal space, bent outwards just behind the median vein, then following a straight course and ending on the inner third of the inner edge. A small, dark, discal dot, and small, rounded, reniform spot at a considerable distance from it. The outer, dark line is bent at right angles inwards, the portion below the fourth median vein is parallel with the inner line; the portion above is parallel to the outer edge of the wing, slightly sinuate in its course and angulated inwards on the costa. Hind wings pale, faded whitish, with a faint, ochreous tinge in the middle. A dark, conspicuous, discal dot; a single line curved in a semicircle in the middle of the wing; edge of wing shaded broadly with blackish, fading out towards the inner edge, with a narrow, pale, interrupted line beneath the fringe and dark shade. Fringe concolorous with the wings. Abdomen, legs and body beneath pale whitish, ochreous. Beneath fore wings dusky, hind wings whitish, with the dots, outer lines and marginal shade reproduced. Fringe a little paler than the wings, that on fore wings darker than on hind wings. Agrees with Lederer's figure, Wiener Ent. Monats. vii. Pl. 8, fig. 9.

Length of body ♂, ·55 of an inch, ♀ (abdomen broken off); of fore wing ♂, ·55, ♀, ·43 of an inch. California (Edwards).

This dull colored species differs from the others in the obscureness of its markings, and in the pale hind wings with the broad, dark border. One of the two males is nearly twice the size of the single female, but a large suite of specimens may show that the equality of the sexes is as usual. The male wants the outer, much curved line, present on the hind wings of the other sex. There is a very faint, reddish tinge on the fore wings of one of the males.

Botys semirubralis, n. sp.—1♂. A species of the normal form, with palpi of the usual form and length. The apex of the fore wings is rather blunt, but the hind wings are of the usual form. Body and basal half of fore wings dull, dark, sable-brown, including the palpi and legs. Fore wings dull sable-brown, immaculate to beyond the middle, except a small, round, brown, discal dot. Outer portion of the wing dull, brick red, with a little paler, diffuse, slight, submarginal shade. Fringe dull, reddish-brown. Hind wings dull, sable-brown, with a vinous tinge; fringe pale reddish wine color. Beneath, fore wings dusky in the middle portion, becoming reddish-brown on the costa, and pale, faded reddish on the outer edge of the wing. Hind wings pale, faded brick red on costal region; fringe of the same color, the inner region of the wing paler.

Length of body, ·45 of an inch; of fore wing, ·50 of an inch. California (Edwards).

This species may readily be distinguished by the blunt apex and the dull brick red outer half of the fore wings, contrasting with the dull umber or sable-brown ground color.

Botys perrubralis, n. sp.—2♂ 1♀. A species of the usual form. Body and fore wings deep ochreous-yellow, with bright red scales. Palpi reddish-brown externally; tongue white; head reddish-brown above, beneath white; patagia red. Fore wings bright ochreous-yellow washed with red at the base; base of costa reddish; a little beyond a twice zigzag, red line, bent inwards on the median vein, and outwards on the submedian. A distinct, red, discal spot, a few scattered red scales run across the wing below, with a fine, red line parallel with the outer edge and running from the inner edge to the red portion and ending on the median vein. Outer third of the wing bright red, enclosing a large, roundish, yellow spot on the outer fourth of the costa. A faint, yellowish shade towards the apex, ending in a series of faint, marginal spots; the inside of the red portion is inclined to be dusky. Fringe vermilion red. Abdomen and hind wings glistening whitish, the latter with a small, black, discal dot; a broad, submarginal shade, not reaching the costal region, while the fringe is reddish, often faded white. Legs whitish. Beneath, both wings whitish, edge of wings dusky, instead of red (sometimes reddish); costa dark brown; fringe pale vermilion. Hind wings as above. Body silvery cream-white beneath.

Length of body ♂, ·45, ♀, ·50 of an inch; of fore wing ♂, ·48, ♀, ·54 of an inch. California (Edwards and Behrens).

The bright red markings and outer edge will readily characterize this species.

Eromene Californicalis, n. sp.—3 ♂. This beautiful species is closely allied structurally to *E. bella* of southern Europe, but the wings are a little longer and narrower, and the palpi are rather longer. Body and wings dull cream color; head and thorax with a pale ashen hue. Fore wings dusted with scattered brown scales; basal half of the wing immaculate, just beyond the middle a slightly curved, narrow, silvery line crosses the wing and is bordered widely on each side with yellow ochreous. Beyond is a clear space, but very finely dusted with fine, brown scales. The usual submarginal, once broadly angulated, white line edged with deep ochreous; a short, oblique, white line parallel to the costal portion of the longer line, which cuts off the apex. The marginal, oblong, black, conspicuous dots, ending in bright, shining, metallic spots are arranged as in *E. bella*, just reaching the angle of the white line. Fringe pale, with two, fine, dark lines. Hind wings whitish, immaculate. Beneath, a little dusky on the fore wings, with eight or nine black dots on outer edge. Hind wings whitish.

Length of body, ·41 of an inch; of fore wings, ·41 of an inch. California (Edwards).

A beautiful moth readily recognized by the nine black spots on the lower part of the outer edge of the fore wings ending in bright, metallic points.

Calaclysta metalliferalis, n. sp.—1 ♂ 3 ♀. Wings rather broad; hind wings deeply notched. Pale brown with an ochreous tinge; thorax ochreous. Fore wings ochreous brown, an obliquely straight white basal line; a parallel similar line beyond, bent on the costa, enclosing a broad pale brownish band; a broad white band, diffuse externally, crosses the wing, and is limited externally by a filiform brown minutely zigzag line, which is much curved above the fourth median venule, and just below sends an acute angle inwards. (This line is more distinct in rubbed specimens). A marginal white line very diffuse on the inner side; beyond it towards the costal, a narrow ochreous brown line. Still beyond are two or three very fine dislocated hair lines at the base of fringe, which is pale brown, consisting of brownish and whitish scales. Hind wings whitish at base, a few dark long spatulate scales along the hinder portion of the wing. A dark spot within the middle of the inner margin of the wing. An outer curved waved brown line, edge of wing brown. The white band below the notch enclosing five conspicuous black dots, with five black square spots beyond alternating with bright shining metallic points. Abdomen pale brown, a few ochreous scales at base; segments whitish on hinder edge. Legs whitish silvery. Wings beneath dull ash brown, a whitish discal streak, the outer line common to both wings, dusky and obscure; the marginal white line distinct towards the costa, but the other lines not reproduced. Black and metallic points as above.

Length of body, ♂, ·34 of an inch; ♀, ·26 of an inch; of fore wing, ♂, ·33; ♀, ·33 of an inch. California (Edwards).

This species has the conspicuous, black and steel blue metallic spots on the hind wings, as in our eastern, and in the Brazilian species, described by Guenée. It does not follow the analogy of the European *C. lemnalis*, in which, as Guenée observes, the black and metallic points are represented by simple white points.

Pyralis farinalis Linn. Two specimens from California, collected by Mr. Edwards, do not differ from New England examples.

FAM. **Pterophoridæ.**

Pterophorus pergracilidactylus. n. sp.—1 ♂. A very slender species, with a long body, very long legs, and the wings unusually long and narrow. Body and wings ash brown. Head whitish on vertex, reddish brown in front; palpi reddish brown with some white scales. Antennæ whitish ringed with brown. Thorax brownish above, becoming whitish on the sides and extending along the abdomen; a small dark irregular dot on the front end of each abdominal ring; brown on the sides with scattered dark scales; beneath whitish with numerous dark scales, with a pair of large dark spots usually meeting beneath. Fore wings very narrow, split widely apart the usual depth; the costal branch narrow and curved; the hinder branch nearly twice as broad as the costal, the extremity falcate and very acute. The wing is reddish ash brown, paler on the costa where are numerous white scales, with a few blackish ones. A black dash at the fork, a few black scales at the tip of both branches, the posterior edge of the hinder branch whitish. Fringe mouse colored. Hind wings with three long narrow not spatulate branches, the two anterior uniting on the basal third of the wing by a distinct web. Entire wing and fringe mouse colored. Legs white ringed with brown.

Length of body ·45 of an inch; fore wing ·55 of an inch. California, (Edwards).

This interesting form is allied to the European *P. pterodactylus*, but the wings are still narrower and the legs longer, but it is still more closely allied to and represents our eastern *Pt. cinereidactylus* of Fitch, a specimen of which is in the museum of the Peabody Academy of Science, collected by Mr. F. W. Putnam, at Salem, Mass., Sept. 26th. In the latter species the hinder division of the fore wing is more triangular, less acutely pointed than in the Californian species, and the markings on this division differ a little.

Pterophorus sulphureodactylus, n. sp.—5♂ 3♀. Fore wings divided on outer third, the two divisions rather wide, the costal one reaching considerably beyond the hinder, and ending in a very acute point; the hinder division broad halberd-shaped. Body and wings sulphur yellow, legs a little paler, tarsi whitish. Fore wings unspotted, clear sulphur yellow, except a slight brown costal streak on the outer fourth of the wing. A minute brown dot at the bottom of the fork. Hind wings pale mouse color, under side of fore wings deep mouse color, costa yellow, with some brown scales, especially towards the base. Fringe pale yellow. Two anterior divisions of hind wings mouse colored beneath, 3d yellow beneath, with fringe yellowish at base, beyond pale mouse colored. Palpi whitish yellow, streaked with ochreous scales; legs streaked with brown scales.

Length of body ·42 of an inch; fore wings ·50 of an inch. Goose Lake, Siskiyou Co., California, July 26, 27. (J. Holleman).

This handsome bright sulphur yellow species is allied to the European *Pt. osteodactylus*. I know of no American species related to it.

Pterophorus cervinidactylus, n. sp.—1 ♂. Head with an unusually long and large tuft of scales projecting slightly beyond the second joint of the palpi. Wings shorter than usual, and broad in proportion; the split in the primaries quite short, the costal division very broad, the apex triangular; the apex of hinder division triangular, the outer edge very oblique, the hindermost division of the hind wings shorter and narrower than usual. Body and wings fawn color; vertex of head whitish fawn; frontal tuft rather darker. Antennæ annulated with whitish fawn and brown. Palpi brownish. Fore wings fawn brown; paler, subochreous along the inner edge, with a concolorous patch on the costa a little within the apex; a black dot just above and near the end of the split. Fringe concolorous with the wing. Hind wings with the first division spoon-shaped at the end; third very short and blunt at end; entire wings fawn color, with no dark brown scales in the fringe on third division. Legs whitish-brown, hind pair as far as middle of tibiæ, beyond brown, spurs paler. Beneath uniformly brown, thickly dusted with paler scales; with a large pale cloud on the costal division of primaries.

Length of body ·48; of fore wing ·43 of an inch. California (Edwards). This species may at once be known by its hind short wings, its uniform fawn color, and by the faded ochreous cloud near the apex of costal division of fore wings. It is remotely allied to *Pt. pterodactylus* of Europe, but differs decidedly in the costal divisions of the fore wings, being much more acutely produced. Besides these I have received, through Mr. Edwards, two other species of this genus from California, but too imperfectly preserved for description.

XXIV.—*Notes on some Pyralidæ from New England, with Remarks on the Labrador Species of this Family.*

BY A. S. PACKARD, JR.

Read January 6, 1873.

AMONG the specimens of this group, in the Museum of the Peabody Academy of Science, are several species which occur frequently in New England, and are so well marked that I have ventured to describe them, without waiting for more material from other localities.

I am unable, so far in my studies on this group, to find any valid characters separating the "Phycidæ" from the family Pyralidæ, whether we regard the larval or imaginal characters. They seem to me to be intimately related on one hand to the lower Pyralids, such as Botys and Scopula, and on the other to the Crambi. Certainly the "Phycidæ" should not rank as a family, but take their place as a subordinate group.

Acrobasis rubrifasciella, n. sp.—8♂ 7♀. Antennæ of ♂ with the usual tuft on basal joint; the palpi slender, pointed, ascending vertically. Body and fore wings slate-ash, glistening; thorax tinged with reddish-brown, and with the head giving off faint metallic colors; palpi blackish on the outside. Fore wings rather broad; just within the basal third a straight line of raised scales, extending from the inner edge and stopping short of the subcostal vein, conspicuously black externally, concolorous with the wing within; the black line bordered externally with bright vermilion (sometimes wanting), which usually reaches the costal edge. Base of wing slightly paler than middle of the wing. A light, triangular, paler shade in the costal region of the middle of the wing, enclosing two small, conspicuous, twin black dots. A submarginal faint, pale, narrow line curving outward in the middle and with four or five acute scallops. Fringe concolorous with the rest of the wing. Hind wings pale, glistening, cinereous. Beneath, fore wings quite dusky, with no markings; hind wings much paler, growing darker towards the costa. Legs dark ash, paler at the ends of the joints, especially the hind tibiæ, which have a whitish band around them; hind legs whitish within.

Length of body ♂, ·40, ♀, ·40 of an inch; of fore wing ♂, ·38–·40, ♀,·40 of an inch. Orono, Maine. (Packard.)

This species is at once recognized by the broad bright-red transverse stripe just within the middle of the wing. This stripe varies much, being sometimes not present, at others not reaching the costal edge. In one additional specimen from Maine, the fore wing has scattered reddish scales at base and beyond the middle, while the dark transverse stripe is wanting, and the red portion forms a broad transverse bright-red band. The larva lives in June and early in July between the leaves of the alder, where it makes a horn shaped case of black cylindrical pellets of excrement, arranged regularly in circles, the additions being made around the mouth of the case. The case is about an inch and a half long; its mouth a quarter of an inch in diameter. Within it is densely lined with white silk. The pupa is of the usual color, mahogany brown, the end of the abdomen rounded, with six hairs projecting from a transverse supraanal projecting ridge. On each abdominal segment is a dorsal dusky transverse stripe, widest on the basal segment. The larva was not described in my notes. The pupa state lasts about two weeks, the moth which I reared appearing July 24th, the larva having been found July 6th.

The Museum of the Peabody Academy of Science also contains ten specimens of this moth reared by Mr. J. H. Emerton. The larvæ were found feeding on the Sweet Fern (*Comptonia asplenifolia* Ait.), July 7, 1866, at Hamilton, Mass., the moth appearing July 20th. The case is quite different in form from that previously described, being regularly oval cylindrical; ·55 inch long and ·35 inch in diameter. It is constructed in the same manner as those found on the alder. This striking difference in the form of the case may possibly be due to the difference in the form of the leaves of the food plant, the large broad leaves of the alder inducing the larva to build a horn-like, much elongated case; while the narrow smaller leaves of the Sweet Fern may have led to the formation of a short, oval case. These differences are such as we would ordinarily regard as specific, but neither do the pupæ or adults reared from the two plants differ appreciably.

Myelois albiplagiatella, n. sp.—2 ♂. Body long and slender, palpi large and quite long, wings long, with the outer edge of primaries unusually oblique. Dull cream or whitish buff, head and palpi whitish buff. Fore wings pale buff color with a single long broad white stripe extending from the base of costa to the apex, the extreme outer ¼ of costa being buff; lower edge of the white band slightly dusky, and the wing along the middle is deeper buff than along the inner margin. Fringe a little paler than the wing. Hind wings whitish. Abdomen white. Beneath both wings are uniformly pale whitish buff. Body and legs of an intenser white.

Length of body, ·57 of an inch; of fore wing ·55 of an inch. New Hampshire, May and June (C. A. Walker).

This is quite different from *Myelois grossulariæ* Pack. (described in the "Guide to the Study of Insects," page 331, under the name *Pempelia grossulariæ*), and which, as suggested by Prof. P. C. Zeller, may prove on comparison to be identical with the European *Myelois convolutella*, Hübn. (See Entom. Zeitung Stettin 1871, p. 177) which preys on the gooseberry. The present species differs much from *M. grossulariæ* in having a longer body and wings, and much larger palpi; and in the style of markings. It may be at once known by the single long broad white line along the costal edge of the fore wings.

Pempelia ovalis, n. sp. 1 ♂. Palpi large and broad; antennæ tufted at base as usual; fore wings oblong, not very long, outer edge less oblique than usual. Body and fore wings ash, being covered with whitish and brown scales. Fore wings with a short curved dark line at base on the median vein. On inner third of wing a very broad brown band, directed obliquely outward from the costa to the inner edge, and enclosing a large distinct, regularly oval (longitudinal), ochreous spot between the median and submedian veins. Two obscure black discal points situated as usual; the outer one is enclosed in a dusky shade crossing the wing obliquely and limited beyond by the usual submarginal white zigzag line; this line is curved inward below the costa; from the middle of the wing to the inner margin it is exactly parallel to the outer edge, terminating in an angle directed outwards. Between this line and the edge is a series of dusky bars, the interspaces cinereous. A marginal black line. Fringe cinereous. Hind wings pale smoky. Beneath fore wings dusky. A whitish costal spot near the apex, but no line. Hind wings slightly paler. Abdomen concolorous with the hind wings. Legs dull ash ringed with whitish.

Length of body ·40 of an inch; of fore wing ·40 of an inch. Maine, (Packard).

Easily known by the oval ochreous spot on the inner third of the fore wings.

Nephopteryx latifasciatella, n. sp. — 1 ♀. Of the usual cinereous color. Fore wings rather oblong, the outer edge being less oblique than in *N. Ed-*

mandsii Pack. and other allied species; base of wing pale whitish ash, beyond a broad dark shade crosses the wing, limited externally by a white distinct zigzag line which is directed obliquely outward towards the inner edge; the line has an acute narrow point running inwards on the median vein, and a broader angle directed inwards on the submedian vein, the line directed outwards at its termination on the inner edge. A costal dark shade on the outer edge of this line. In the middle of, and extending across, the shade is a long ochreous spot. The two discal black dots are more obscure than usual. The submarginal white line is very distinct, consisting of three scallops, the middle one forming a grand curve extending from the subcostal vein around to the submedian, the curve is well rounded not angulated as in *N. Edmandsii.* This line has a dark shade on both sides, distinctly on the costa. A marginal row of distinct black dots. Fringe concolorous with the rest of the wing. Hind wings of the usual shade. Fore wings dusky beneath, with a costal submarginal pale line. Legs cinereous, hind tibiæ with a dark ring, tarsi ringed with whitish.

Length of body ·35 of an inch; of fore wing ·38 of an inch. Maine, (Packard).

This species may be known by the broad dusky shade on the inner third of the fore wings, enclosing an ochreous patch. It is of about the same size as *N. Edmandsii.*

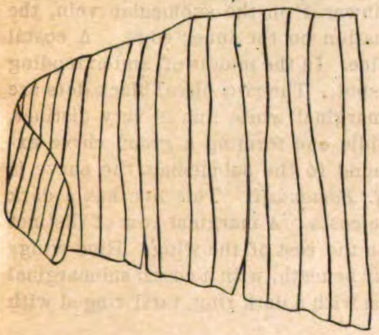
Nephopteryx roseatella, n. sp.—2 ♂. With the same cut of the wings and almost exactly repeating the coloration of the European *Pempelia semirubella,* it has all the structural characters of Nephopteryx. The palpi are larger and less ascending than usual; antennæ without the tuft of scales with short broad joints, well ciliated beneath. Front with longer scales, than usual. Head and palpi reddish. Costa of fore wings conspicuously white, the band not reaching the apex, the rest of the wing dull roseate; inner edge whitish, the band not reaching the inner angle. Hind wings whitish. Beneath fore wings a little dusky; hind wings same as above. Two hind pairs of legs reddish externally.

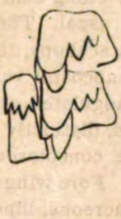
Length of fore wing ·37 of an inch. Dorchester, Mass. (F. G. Sanborn).

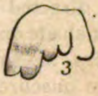
In one specimen the roseate color on the wings has apparently faded out into a pale drab, but the head is red. Though the antennæ are without the usual tuft of scales, and the palpi are longer than usual, I should judge that it was a Nephopteryx.

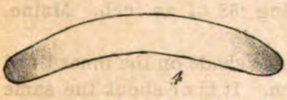
REMARKS ON CERTAIN LABRADOR PYRALIDÆ.

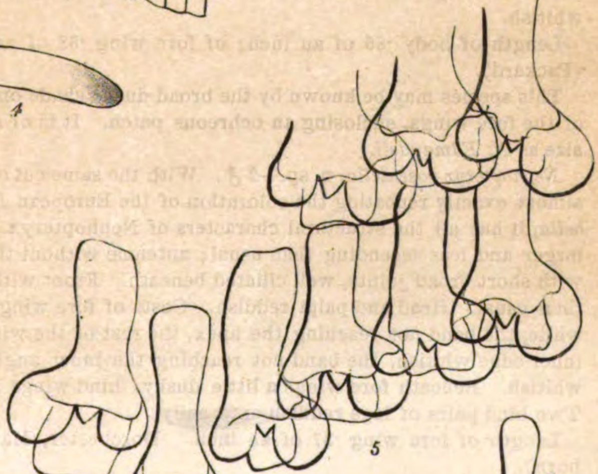
In his Beiträge zur Schmetterlings Fauna von Labrador (Entomologischer Zeitung, Stettin, 1870, p. 371), Herr H. B. Möschler makes some interesting remarks on the moths described by American writers from Labrador. As soon as I

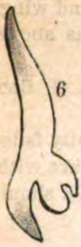


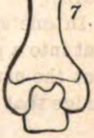


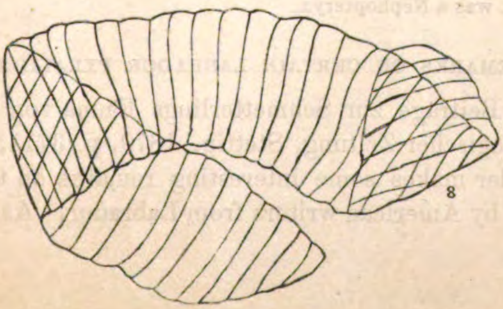


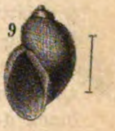












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CONTENTS.

XIX.—On the Lingual Dentition of Certain Terrestrial Pulmonata Foreign to the United States. By THOMAS BLAND and W. G. BINNEY. *Continued*, ... 223

XX.—The Upper Coal Measures West of the Alleghany Mountains. By JNO. J. STEVENSON, ... 226

XXI.—On the Lingual Dentition of Gæotis. By THOMAS BLAND and W. G. BINNEY. (With plate XI in part.) 252

XXII.—Note on a curious form of Lingual Dentition in Physa. By THOMAS BLAND and W. G. BINNEY. (With plate XI.) 255

XXIII.—Catalogue of the Pyralidæ of California, with descriptions of new Californian Pterophoridæ. By A. S. PACKARD, Jr., ... 257

XXIV.—Notes on some Pyralidæ from New England, with Remarks on the Labrador Species of the Family. By A. S. PACKARD, Jr., ... 267

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can obtain specimens from Europe with which to compare the species I have described as new, I shall give the results of the comparison and refer to Herr Möschler's valuable remarks.

Botys inquinitalis Zeller. Having received two specimens of this species from Lapland, through the kindness of Dr. Staudinger, and observed how much the two specimens differ from each other, I am disposed, with Dr. Staudinger (Catalog., etc.) and Herr Möschler, to refer my *Scopula glacialis* (*l. c.* 52) to the above species.

My specimens differ from the two others, in being paler in the middle of the fore wings, with the outer line consequently much more distinct. On the under side the same line is repeated with more distinctness, while the five black costal spots are smaller and consequently farther apart than in the Lapland examples. Otherwise the species agree with those from Lapland.

Pempelia fusca (Haworth). Möschler regards my *Eudorea? frigidella* (Proc. Bost. Soc. Nat. Hist., 1866, p. 53) as identical with *E. centuriella* S. V. I fear Herr Möschler has been misled by my doubtful reference of this species to Eudorea. Having since received four specimens from Lapland and Iceland, of *Pempelia fusca* (Haworth), I find that my specimens belong undoubtedly to that species. I have also specimens from Orono, Augusta and Brunswick, Maine, captured in July and August. These differ in no respect from the Labrador and European examples.

Scoparia albisinuatella (*Eudorea? albisinuatella* Pack. *l. c.*). As regards the identity of this form with *S. centuriella*, I should hesitate to decide until I have specimens from Europe with which to compare my example.

XXV.—*Note on the Coals of the Kanawha Valley, West Virginia.*

BY JNO. J. STEVENSON, PH. D.

Read February 17, 1873.

ALONG the Great Kanawha river the Upper Coal Group is observable up to about twelve miles below Charleston. It contains two coal beds of workable thickness. The lower one is the *Pittsburg* (VIII of Ohio section) and is usually known as the "Raymond seam." It is much reduced in thickness where it crosses Pocatalico Creek and is very inferior in quality to the same bed in its northern extension. The limestone overlying this coal in Northern Ohio and Pennsylvania, as well as in the northern part of West Virginia, is here greatly degraded, being represented by only a calcareous shale containing a few nodules of limestone. The upper bed of coal is occasionally of workable thickness, but is of no economical importance. When the section has been completed this coal will probably be proved identical with the one given in Dr. Hildreth's section at Pomeroy, which is No. X of the Ohio section, and likely the equivalent of the *Uniontown* coal of Pennsylvania.

The Barren Group reaches to Charleston and runs out in the hills a short distance above the city. It is about five hundred feet thick and contains, as far as I am informed, no workable coals. It is interesting to note that along a rudely north and south line, beginning at Pittsburg and running to the Great Kanawha, the Barren Group varies but little in thickness.

The Lower Coal Group sinks under the river a short distance below Charleston. Its development here, as compared with that observed in the coal field farther to the north, is extraordinary. In northern West Virginia the thickness is barely two hundred feet; in the First Geological District of Ohio it rarely exceeds three hundred feet; while in either case it contains only six or seven coal beds. In this valley it is readily separable into two portions, the upper of which is exposed along the river from Charleston to the Falls, a distance of thirty-five miles. Including the Mahoning sandstone it is not less than nine hundred feet thick, and contains at least fifteen beds of coal, each of which is of workable thickness at different localities. The lower division is exposed above the Falls to Sewell Mountains, a distance of certainly thirty miles in a straight line. It contains only two or three beds of coal that are anywhere of workable size, and is made up chiefly of massive sandstones, with rarely a thin shale or limestone. The estimation of its thickness is attended with some difficulty, as the dip is undulating, and there may be one or two broad anticlinals. There is no reason to believe, however, that it is any thinner than the upper division. We have here, then, a total thickness of not less than eighteen hundred feet, with about twenty coal seams, most of them workable at some point. The extraordinary development of this group continues southwesterly, until its thickness becomes about twenty-five hundred feet in Tennessee. A careful survey of the State of West Virginia would doubtless reveal some very important facts in this connection, and would aid in solving some perplexing problems arising from this variation.

The Mahoning sandstone is conspicuous in the river hills above Charleston, and, as in its northern extension in this state and Pennsylvania, holds about midway a coal which frequently becomes of available thickness. It rests upon a variable bed of black flint, five to twelve feet thick, which is occasionally associated with a thin seam of cannel.

A few feet below the flint, and separated from it by shale, often arenaceous, is a coal partly cannel and partly bituminous. At Cannelton it is five feet four inches thick, and on Paint creek, near Coalburg, it is seven feet. This is usually regarded as identical with the *Upper Freeport* of Pennsylvania (VI of Ohio). Aside from its position one finds in its deportment evidence of this identity, since, wherever I have observed it in West Virginia, it shows a decided tendency to become partly cannel. Though I have not visited Peytona, yet an examination of the map, and the fact that Coal river heads near that locality and so cannot have cut very deeply into the country, seem to render it probable that this coal, known locally as the "Stockton seam," is the same with the cannel there worked. It seems hardly possible that the "Gas coal," situated five hundred and fifty feet below the "Stockton" at Cannelton, can be available at Peytona.

At Cannelton a five feet coal is seen a few feet below the last, but at Coalburg it is absent, or is represented by two small seams occupying about the same relative position. Mr. Ridgway identifies this with the *Lower Freeport* of Pennsylvania. That is an exceedingly variable bed, and cannot be traced satisfactorily in southwestern Pennsylvania or northern West Virginia. The whole of the state lying between the Baltimore Railroad and the Great Kanawha river, is as yet unexplored. Under such circumstances it is doubtful whether one is justified in making the determination solely upon the ground of relative position, this being, at best, an unsafe guide.

At Cannelton the second seam below the "Stockton" is a cannel of insignificant thickness. At Coalburg, however, this place is occupied by the "Great Splint Coal," which in some respects is the most important bed along the river, although its importance is probably local. At the Kanawha Salines no such bed appears, but where it should be there occur several thin beds considerably separated. On Paint and Cabin creeks its thickness is not far from eleven feet and on Campbell's creek, if Mr. Ridgway's identification be accurate, it is six feet. At Coalburg it has been worked extensively for several years by the Kanawha and Ohio Company, under the superintendence of Mr. William H. Edwards, so favorably known to the scientific world by means of his beautiful work on the *Butterflies of North America.* At the mines of this company the bed exhibits the following section:

1. Sandstone, ...	
2. Clay shale, ...	1 inch.
3. *Coal*, ...	6 inches.
4. Dark slate, ...	4-7 inches.
5. *Coal*, ...	3 feet, 2 inches.
6. Clay, ...	3-5 inches.
7. *Coal*, ...	1 foot, 6 inches.

The roof is very irregular. Not unfrequently a huge clay "hip" comes down two or three feet, crossing the entries in a rudely northeast and southwest direction, and having a width of from five to twenty feet. Such "hips" are not always of clay but are sometimes an odd mixture of sandstone and coal, the latter included not as layers, but as fragments, as if it had been cut out after consolidation, though in several instances the bowl-shape of these fragments leads to the belief that it may have been removed before consolidation. These "hips," when traced across different entries, are seen to taper off at each end.

The thin layer of clay ordinarily interposing between the sandstone and coal contains numerous impressions of *Lepidodendron* and *Sigillaria*, but usually in poor preservation. Some years ago a series of remarkably fine leaf-scars of *Bothrodendron* were found in entry I of the company's works. Of these, several were sent to the Smithsonian Institution and to Mr. Lesquereux. The rest were retained by Mr. Edwards, but were lost during the destruction of his house by fire, a year ago.

The dark slate, No. 4, is rich in bitumen, breaks with a semi-conchoidal fracture, but does not burn readily and is regarded as detrimental to the coal. The *coal*, No. 5, is the most important portion of the seam, and with No. 3 affords the marketable coal, which is sold in Cincinnati as Kanawha semi-cannel. When first shipped the proprietors named it "Splint," simply to distinguish it, and without reference to the British signification of the term. This name was afterward applied to all the open-burning coals of the Kanawha Valley. The coal is clean, breaks with a neat, sharp fracture, bears transportation well and contains no appreciable quantity of sulphur. It is made up of thin alternating layers of cannel and bituminous coal, for the most part not more than one-twelfth of an inch thick, though occasionally a layer of cannel occurs one or two inches. It is consequently dry and open-burning, with no tendency to cake upon the fire. The "slack" yields a coke of only slight density. Owing to the open-burning character, as well as to the freedom from sulphur, this coal is destined to become of very great economical importance. Experiments have been made with it in the iron furnaces of southeastern Ohio, and in each case it has proved to be of the best quality. Owing to the uncertain outlet afforded by the Kanawha river, little has been done with this coal, but, now that the Chesapeake and Ohio Railroad has been completed, the operators in the Kanawha Valley will be able to forward a steady supply, so that its introduction into southeastern Ohio for use in iron smelting is a matter of comparatively short time.

No. 7 is variable in thickness and contains more bituminous coal than the preceding. It is of excellent quality but is too brittle to bear transportation. The larger proportion of bituminous matter led to the belief that it could be coked, but experiments in this direction have not been successful.

The clay parting, No. 6, is of uncertain thickness. At the mines of the Kanawha and Ohio Company, it is seldom more than four inches, but followed westward it rapidly increases, so that at the western boundary of the company's property it is two feet. A similar increase, though by no means so great, is observable in the upper parting, so that, as far as one may judge with the imperfect exposures presented, there is much reason to believe that the thin coals at Kanawha Salines, occupying the position of this bed, are nothing other than its subordinate *coals*, 3, 5 and 7, separated by the partings, 4 and 6, greatly increased in thickness.

About forty feet below this coal is found a seam of cannel, nearly three feet thick, well exposed at Cannelton, Paint creek and on both sides of the river at Coalburg. It is of good quality and will probably prove of much value.

Five hundred and fifty feet below the "Stockton" coal at Cannelton, there is a bed of bituminous coal nearly seven feet thick and known as the "Gas coal." This is seen at

Coalburg and has been worked opposite that village on the northeast bank of the river. Its thickness there is inconsiderable, barely three feet, and its quality poor. At Cannelton Mr. Ridgway observed a limestone below this coal, which he identifies with the *Ferriferous* of Pennsylvania. This is not exposed at or opposite Coalburg and I did not observe it at Cannelton. If Mr. Ridgway be accurate in his determination of the limestone, the "Gas coal" is very probably the *Kittanning* of Pennsylvania (No. IV of the Ohio section). In this case the persistent seam a short distance below the limestone is the equivalent of the Ohio No. III.

The coals below these belong to the lower division of the group, which I had no opportunity to examine. They are said to be well exposed in the gorge of New river.

The dip of the strata below the Falls of Kanawha to Charleston is somewhat less than 30′, but below Charleston they are horizontal, or at least the dip is inappreciable. Above the Falls it is very undulating and one may expect to find one or more broad anticlinals between the Falls and Big Sewell Mountain.

P. S. The map (plate xii.) accompanying this paper was prepared for the article on the *Upper Coal Measures* (pp. 226–252), but was not completed in time to appear with it.

XXVI. — *On the Subdivisions of Science and their Classification.*

BY LOUIS ELSBERG, M.D.

Read February 3, 1873.

THE distinguishing characteristics of man are centred in his ability to "know" and to "do." Knowledge, accumulated and systematized, has become science; in a somewhat similar manner action has given rise to art. It would lead me too far from my present subject to trace the genesis and continuous development, up to the present day, of either science or art. Of the latter this has never been philosophically attempted so far as I know; of the evolution of the former, HERBERT SPENCER has given a brief but very able account in an article republished in his "Illustrations of Universal Progress" (New York, Appleton & Co., 1864), and occasionally also in other works.

Classification of the subdivisions of a subject is an important means of making clear to ourselves and to others our apprehensions; it may be looked upon as a condensed exposition of the views we hold regarding the subject. It should be made out, I think—except for specific purposes—objectively, *i. e.*, the subjects of the classification should be considered, as much as possible, as to themselves more than in relation to the classifier; although, on final analysis, it becomes obvious that all human learning (knowledge as well as art) is subjective, simply because it is human and therefore relative.

I may state, as a fundamental discrimination, the one between the knowable and the unknowable; and as to the knowable, that between the known and the unknown. It is self-evident that beyond this verbal statement, there can be for us no subdivision and no classification of the unknowable and the unknown.

It has been held that the known should be classified after the order in which it has been, or may be, built up in the human consciousness; and it has actually been attempted to be classified after an assumed order of creation; but, as HERBERT SPENCER has shown in the article mentioned, it cannot be rationally arranged in any serial order. Each of the subdivisions of science, in which a sufficient amount of exact knowledge has been accumulated to have been generalized and systematized, is entitled to the independent name of science; but we must never lose sight of the fact that it is in reality a part of one whole, viz., human knowledge.

Per se, all the subdivisions, or "the Sciences" are coördinate, not subordinate. As HERBERT SPENCER, in another place truly says:—"No succession in which the Sciences can be placed represents either their logical dependence or their historical dependence." (The Classification of the Sciences: N. Y., Appleton & Co., 1864.) And there can be no "hierarchy of the sciences," as AUGUSTE COMTE calls the order in which he classifies them; although we are apt to attach greater or less importance to any particular science, in accordance with its relation and benefit to us and human affairs, and are perfectly justified in doing so.

The classification I present to you (see table, at the end of this article), I intend not as an ideal, but as a practical one. It is by no means perfect; but, I think, the most conformable to the present state of knowledge. I claim no credit for devising it. My task has rather been the arduous one of revising; of collating, judging, rejecting and compiling. Some of the names are new; and some are used in a wider sense than that in which they are ordinarily employed, and therefore need explanation.

As already stated, Science and Art have been gradually evolved from man's ability to know and to do; and science and art together are included under the term Mathesis, meaning everything that can be learned.

Throughout the whole extent of the classification there are connecting links and transitions precluding sharp limitations; thus there are connections not only between the sciences themselves, but also between science and art; indeed every science includes something to be practised, and every art something to be known aside from what is to be performed. The epithets pure and mixed on the one hand, and pure and applied on the other, to denote these associations and interrelations, have frequently been used rather loosely. I propose to have the term "mixed" confined to associations between the sciences, and the term "applied," to those between sciences and arts; thus I would speak of mixed mathematics to designate the mathematics of phonology, of thermology, or of morphology; and of applied mathematics to designate that of surveying or of navigation. As many branches or collective systems are each both a science and an art, as, for instance, music, astronomy, etc., both mixed and applied mathematics may appertain to these. Mixed sciences may receive names compounded of the names of their components.

The term science includes all knowledge. It is what has been called by some Pantology; by HÆCKEL, Kosmology, equivalent to Theology in its all-inclusive sense; by STEPHEN PEARL ANDREWS, Universology. If we limit the termination "ology" to concrete science, these terms become inadequate for us, whilst the word science answers all purposes.

A few words on the subject of hybridity, in combining words or roots derived from different languages, may not be out of place here. I think when exercised with judgment, such compounding frequently enriches and improves rather than debases language. Having adopted the suffix "ology" for the branches of concrete science, I regard it as perfectly proper to add this affix to words even if they are not derived from the Greek.

In tabulating the subdivisions of science, I have made use of horizontal and vertical brackets. I may say that by the former I propose to indicate divisions which result from different points of view which may be taken, and by the latter divisions referring more obviously to separate departments of being. These two kinds of subdivision, which I call, respectively, aspectual and departmental, are on different planes, as it were, and intersect each other. Each aspectual subdivision of a science is applicable to all departmental subdivisions of the same, and *vice versa;* for instance, zoology, which is a departmental subdivision of physology, is divisible into zoogeny and zoography; and morphology, which is an aspectual subdivision of physology, is divisible into geomorphology and metageomorphology; the former into biomorphology and abiomorphology; biomorphology into zoomorphology, vegetomorphology and protistomorphology, etc.

Science as a whole, and also each science, may be studied from either a general or a special point of view. General science-as-a-whole is equivalent in meaning to what I designate by the word philosophy. Special science-as-a-whole occupies itself with the subdivisions of science, the classification of these, etc. The terms general and special, applied to a subdivision of science, refer to the consideration of that subdivision, either as a whole, or in its parts, and with me correspond rather closely to what STEPHEN PEARL ANDREWS calls analytical and observational, the former dealing more (though by no means exclusively) with generalizations and principles reasoned out, and the latter with facts observed. The terms comparative and descriptive refer to another kind of aspectual division of science, or of any particular science, which is often confounded with that into general and special. Briefly to illustrate the proper designations by an example, general zoology occupies itself with generalizations of the science of animals; special zoology with the facts and details of the domain; comparative zoology, with comparisons, analogies, correspondences and differences of different subjects pertaining to the animal kingdom; and descriptive zoology with the description of the animals themselves. Either general or special zoology may be either comparative or descriptive, and *vice versa.*

The first departmental division of science is into concrete and abstract.

"The broadest natural division among the sciences," says HERBERT SPENCER (The Classification of the Sciences, New York, D. Appleton & Co., 1864. p. 4), "is the division between those which deal with the abstract relations under which phenomena are presented to us, and those which deal with the phenomena themselves. *Relations*, of whatever orders, are nearer akin to one another than they are to any objects.

Objects, of whatever orders, are nearer akin to one another than they are to any relations. Whether, as some hold, space and time are forms of thought; or whether, as I hold myself, they are forms of things, that have become forms of thought through organized and inherited experience of things; it is equally true that space and time are contrasted absolutely with the existences disclosed to us in space and time, and that the sciences which deal exclusively with space and time are separated by the profoundest of all distinctions from the sciences which deal with the existences that space and time contain. Space is the abstract of all relations of co-existence. Time is the abstract of all relations of sequence. And dealing as they do entirely with relations of co-existence and sequence, in their general or special forms, logic and mathematics form a class of the sciences more widely unlike the rest than any of the rest can be from one another."

Concrete science, or the science of the phenomenal contents of space and time, *i. e.*, the science of the objects of nature, is physics in the widest sense; as synonymous with physics in this sense, or in the place of it, I propose the word physology, distinguishing all its subdivisions by the suffix "ology." Abstract science, or the science of space and time, is metaphysics; and this is to me the only legitimate use of the word metaphysics, as a subdivision of science at the present day. I suggest, but without insisting upon it at all, that all subdivisions of metaphysics might receive the distinguishing termination "ics." Although this may appear a bold and impracticable innovation, it is really not so very difficult to carry out, as I shall, for illustration's sake, show under the head of mathematics. If the suggestion be adopted, the termination "ology" would mean concrete science of, and "ics" abstract science of, whatever the other portion of the word indicates; the termination "ics" could then be also used to designate, with the appropriate word taken from the concrete sciences, their abstract science; but I would not, perhaps, myself, carry it out in all its possible details.

I divide metaphysics into the two departments, mathematics and logics, the first relating to space more or less closely connected with time, dealing abstractly with magnitudes, numbers, quantity; the second relating to time more or less closely connected with space, dealing abstractly with ideas, laws, quality. It must be noticed that for this second department of metaphysics, I use the word logics, not logic; I restrict the latter to its ordinary sense, in which it is both a science and an art, viz., human reasoning, and, as a science, constitutes a part of anthropo-psychology which itself is a part of anthropology.

The words abstract and general are sometimes used as synonymes, as, for instance, occasionally by AUGUSTE COMTE; but very improperly, as careful consideration will show to any one. HERBERT SPENCER has taken the trouble to define them accurately and at length. Among other things, he says:—"Abstractness means detachment from the incidents of particular cases. Generality means manifestation in numerous cases." And again:—"A general truth colligates a number of particular truths; while an abstract truth colligates no particular truths, but formulates a truth which certain phenomena all involve, though it is actually seen in none of them." The two words mathematics and logics fully answer all purposes for the two branches into which metaphysics is divisible; but those who so desire, may use as synonymes for them the words choremics and chronics (or even, if they prefer, spacics and tempics), only they must not lose sight of the fact that although one division is preeminently the abstract science of space, and the other that of time, the consideration of time cannot be entirely separated in our consciousness from that of space, nor that of space from that of time.

I desire to show that the suffix "ics" can be applied to the well known subdivisions of abstract science without making a very great change in terms. Thus, mathematics is ordinarily divided into arithmetic, geometry and analysis; analysis into algebra and fluxion or calculus; and the latter into differential calculus, integral calculus and variation calculus. The use of the termination "ics" would make this division read as follows, viz.:—

- Abstract Science relating to Space (more or less closely connected with Time): Mathematics.
  - Concerning (the value of) Numbers: Arithmetics.
  - Concerning (the extent of) Magnitudes: Geometrics.
  - Concerning (the relations of) Quantities: Analytics.
    - Pertaining to Finiteness: Algebrics.
    - Pertaining to Infiniteness: Fluxionics or Calculics.
      - Differential Calculics.
      - Integral Calculics.
      - Variation Calculics.

The other division of abstract science, viz., logics, is scientifically in a state of great incompleteness, although "metaphysicians" have thought and written for thousands of years. While mathematicians—also metaphysicians according to my definition—have been noted for their exactness, logicians (using this word in the proper and wide sense resulting from my use of the term logics) have been noted, as we can now judge them, for their inexactness. This has been due mainly to the fact that in the absence of knowledge, imagination, and morbid imagination, *i. e.*, imagination influenced by feelings, prejudices and fears—especially religious and social or political—was allowed to take its place. As HERBERT SPENCER has it, "it may be said with truth that metaphysics, in all its anti-realistic developments, is a disease of language." Nevertheless there is contained in the writings of metaphysical philosophers—and we may class together both the materialistic and the idealistic ones—much that will hereafter be available for building up the science of logics. But heretofore its domain has not even been recognized, so far as I am aware. The domain of logics has hitherto been confounded with that of psychology, which, as I have said before, is a part of anthropology. Logics is divisible, analogously to mathematics, into three subdivisions, viz.:—

- Abstract science relating to Time (more or less closely connected with Space): Logics..................................
  - Concerning Ideas.
  - Concerning Laws.
  - Concerning Qualities.

For the first subdivision, there exists no name; the term ideology which, according to WEBSTER'S DICTIONARY, has been used to denote "1. A treatise on ideas, or the doctrine of ideas, or the operations of the understanding.—*Jefferson*, IV, 297; 2. The science of mind.—*Stewart:*" is, of course, inapplicable if we confine the termination "ology" to the concrete sciences; so we might coin the word "ideics." For the second subdivision we might use the term "ethics," if we choose to enlarge its meaning; ordinarily it is held to relate only to the laws of morality, etymologically it refers to only manners. For the third subdivision we might use the term "esthetics," although it has hitherto been employed only for the science of but one quality, *viz:* the beautiful.

Physology is aspectually divided into physogeny and physography on the one hand, and into hylology, dynamology and morphology on the other. By the first kind of division I refer to (*a*) the development of the objects of nature in time, or their tempic, *i.e.* motic or sequential existence, and (*β*) their spacic or static existence, or the state of their existence at a definite time, *i. e.* the present. The developmental or genetic knowledge of any branch gives answer to the questions: "How came you so?" "How or what were you before?" The existential or existing, to the question: "How or what are you?" The former science has the distinguishing suffix "ogeny," the latter "ography," which may be expressed by saying that every "ology" has its "ogeny" and "ography." The second kind of aspectual division of physology marks the distinctions which may be made by looking at nature in its manifestations of either matter, force or form. Matter and force appear to be unlimited in space and time, eternal and infinite; form is unceasingly changing. Force is the dynamical aspect of matter, and matter the statical aspect of force; the two are inseparable and presuppose each other; form results from the reaction upon each other, or the interaction, of matter and force, it therefore presupposes the two latter. Hence, therefore, our perception of neither of them can be absolutely separate, although we may turn our attention to either of them predominantly. The phenomena concretely presented to us are those of substance, motion and shape.

By hylology I designate chemistry in its proper sense. Dynamology I use for what is ordinarily termed natural philosophy, or physics in its restricted sense, and what, when it concerns living beings, is ordinarily called physiology. To do away with the confusion that has come from the different uses to which these words have been subjected, I have proposed the nomenclature here presented. When the use of the word physiology for biodynamology (*i.e.* the science of the manifestation of force, viz., motion or function, of living beings) shall have become obsolete—if it ever does—physiology may be substituted for the term physology as being more euphonious. Natural philosophy is, properly, general physology; although all the subjects usually discussed in treatises on natural philosophy belong to general dynamology. The word physics, as I have already indicated, would express the abstract science of concrete science of natural objects. General dynamology is the general science of motion—that concrete science of which the old and obsolete term "phoronomics" might express the abstract science. Motion, as is well known, impresses our senses differently, according to its different kinds. Thus, vibratory motion through space, repeated less than sixteen times in a second of time, produces in us, if we become aware of the motion at all, only the consciousness of mechanical force or "mechanism," as it has been called. Repeated oftener, we receive the impression of sound, unless recurring too rapidly. When the motion is so rapid as no longer to impress us as sound, and still is not frequent enough to give us the consciousness of heat, I believe that it produces in us the sensation of what we call electricity, a belief I have publicly announced for several years. When motion recurs more rapidly than sixty-five trillion times in a second, we become aware of it as heat, until it occurs about four hundred trillion times, when it impresses us as light, and beyond about eight hundred trillion times as chemical force or chemism. In treating of the different effects upon our consciousness of motion repeated with greater or less rapidity in a unit of time, dynamology embraces as subdivisions the particular sciences which treat of these different modes of motion, as phonology, photology, etc.

Of morphology some portions have been well cultivated while some have been neglected. The forms, or states of cohesion, in which matter is found, as solid, liquid or gaseous, have given rise to the subdivisions stereology, hydrology and aerology, to which must probably be added etherology to embrace the fourth or etherial state, of which, however, not much is as yet known. From another point of view, I may say that morphography has been investigated more than morphogeny. A part of metageo-morphography (especially that relating to the sun, its protuberances, etc., called heliomorphography) has lately been studied with renewed zeal, since heliohylology (the chemistry of the sun) has been made possible by the discovery of spectrum analysis. Of abio-morphography, the portion to which especial attention has been given, is crystallography in connection with minerology. Biomorphography is ordinarily termed anatomy, and the advances made in this science, especially in zoomorphography or animal anatomy (or zootomy as it is sometimes called), have been principally due to the needs of medicine and the researches of physicians. Biomorphogeny has been well divided by HÆCKEL into ontogeny (the science of the development of "onta," *i.e.* organic individuals), corresponding to what is ordinarily called embryology, and phylogeny (the science of the development of "phyla," *i. e.* organic stocks or races) corresponding to ordinary palæontology. The scientific investigation of both is a matter of recency. Until comparatively lately, fancy and hypothesis held the place of knowledge in both these branches.

Having discriminated between the science of space and time, on the one hand, and the science of the contents of space and time, *i. e.* the science of natural objects, on the other, the latter may be divided into the two broad departments of the science of natural objects belonging to the earth and the science of natural objects not belonging to the earth. HÆCKEL recognizes this fundamental distinction of cosmology by dividing the latter into uranology, which he defines as the science of nature beyond the earth or the sidereal part of cosmology and pangeology, the science of nature relating to the earth, geology in the widest sense, or the telluric part of cosmology. HÆCKEL'S reason for using the word pangeology, doubtless, is that the restricted sense in which the word geology is ordinarily employed (being defined as that "science which investigates the history of the crust of the earth," instead of embracing, as it does etymologically, everything relating to the earth) seemed to him too firmly established to be disturbed. Rather than use pangeology I would employ tellurology, as STEPHEN PEARL ANDREWS does, hybrid though the word be. It of course includes telluric astronomy. As the complement or antithet of geology (or tellurology), I propose the word metageology (or metatellurology)—a term wide enough to include everything known of concrete science relating to beyond the earth.

The more we enter into details of classification the less sharply drawn our lines of demarcation become; thus, concrete science relating to the earth concerns either living or unliving existences, hence the divisions of biology and abiology,—yet not only is it a matter of great difficulty to determine as to some beings whether they are of exceedingly low vitality or are not alive at all; but the *died* (those beings that have been alive, but are so no longer), unliving though they be, must, for convenience' sake, if for no other reason, be classed under the head of biology. The different subjects of biology, being either animals, plants, or protists, give rise to the sciences of zoology, vegetology and protistology. This division has been introduced by HÆCKEL. Previous to him all living beings were classified into the two kingdoms, animal and vegetable. But a number of living beings have been found to present each, in external form, in internal structure and in all vital phenomena, so remarkable a mixture or combination of distinguishing animal and vegetable characteristics, that it is impossible, except arbitrarily, to account them as belonging to either realm. Most of these beings are so small that with the naked eye they can be seen either with difficulty only, or not at all. The majority of them have, consequently, become known only during the last fifty years, since the more general use and improvements of the microscope. And just as soon as they became known they gave rise to endless and unprofitable disputes as to their nature and position in the organic scale. Many of them botanists called animals, and zoologists plants; *i. e.*, neither wanted to own them. Others again were declared to be plants by botanists, and animals by zoologists; *i. e.*, both parties claimed them. Really they hold a position which can only by violence be incorporated with either realm; and it was a happy idea of HÆCKEL to end the fruitless fight over these doubtful beings by erecting the neutral ground they occupy into a kingdom by itself, a kingdom in a certain way below, yet intermediate to, the two organic kingdoms hitherto recognized. These beings are called neuters, because they are neither plants nor animals, or "protists," because they are lowest in the organic scale, *i. e.*, first after inorganics or unliving beings.

The division of the animal kingdom into Vertebrata and Invertebrata, or Evertebrata, as they were afterward called, we owe to LAMARCK, who introduced this distinction toward the end of the last century.

"Vertebrata are divided into amniota and anamniota, accordingly as the dermal and cuticular elements of the ventral laminæ are in development reflected upwards from the medio-ventral line, so as to meet along the medio-dorsal line, and form thus the fœtal envelope known as the amnion;

or, as no such envelope is superadded to the more or less complex ones, furnished by the maternal organism. In the vertebrate amniota, a second fœtal envelope, the allantois, is always developed, originating from the anterior aspect of the posterior extremity of the trunk as a body, which is at first bilobed and solid, but which subsequently becomes hollow internally, and covered externally with vascular ramifications, whereby in reptiles and birds the respiration, and in mammals both the respiration and the nutrition of the developing embryo are provided for. From their possession of this structure, the amniota are also known as 'allantoidea'; and as gills are never developed upon their bronchial arches, they are also called 'abranchiata,' whilst the anamniota have in their turn the two additional names, 'anallantoidea' and 'branchiata,' as never developing an allantois, at least beyond the stage of a urinary bladder, into which its proximal portion is converted in the higher vertebrata, and as always developing either deciduous or permanent gills." (ROLLESTON, Forms of Animal Life, Oxford, 1870, p. xxxix.)

I accept the name branchiata or branchiate animals, *i. e.*, animals having branchiæ or gills, for the division anallantoidea, but I propose the word pulmonata, pulmonates, meaning animals having lungs, to designate the allantoidea or that division of vertebrate animals comprising the three classes, mammals, birds and reptiles. I, therefore, divide vertebratology into pulmonatology and branchiatology; and pulmonatology into mammalology, ornithology or aviology, and reptilology.

In accordance with the recognized divisions of the mammalia into placental, marsupial and monotrematous mammals —the first being those whose young, during the period of pregnancy, are nourished by means of a placenta within the uterus itself; the second, those who carry their young in a pouch or bag of the abdomen and nourish them there by suckling, and the third, those who have the generative and renal ducts confluent with the terminal segment of the intestine, so as to form a true "cloaca;"—and of the placentalia into discoplacentalia, zonoplacentalia and villiplacentalia,— depending upon the form and nature of the placenta, which is disk- or cake-like in the first, girdle- or zone-shaped in the second, and made up of scattered papillæ or cotyledons in the third;—I divide mammalology into placentalology, marsupialology and monotrematology; and placentalology into discoplacentalology, zonoplacentalology and villiplacentalology.

But my next subdivisions require some further explanation. Linnæus, who made the first successful attempt at arranging in intelligible order the various objects of Natural History, the science corresponding to my subdivision geography or tellurography, placed man, together with apes, monkeys, lemures and cheiroptera or bats, into an order of mammalian animals to which he gave the name primates. (Systema Naturæ, ed. 12, Holmiæ 1766.) Linnæus' arrangement, in many respects, forms the basis of all modern classification, but his order primates was rejected until nearly a hundred years later, Huxley (Evidence as to Man's Place in Nature, New York, D. Appleton & Co., 1863, p. 124) readopted it, but excluded from it the bats. I still further exclude the monkeys, and the lemurs or prosimiæ, keeping in the order primates only the two genera, man and ape, anthropi and anthropoides. The prosimiæ I place in an order by themselves; and all the rest of the discoplacental mammalia, viz., the monkeys excluded from the first order (*i. e.* the tailed catarrhinæ and all the platyrrhinæ), the cheiroptera, the insectivora and the rodentia, I combine to constitute a second order, which I name subprimates. Hence I divide discoplacentalology into primatology, subprimatology and prosimiology; and primatology into anthropology and anthropoidology.

We have thus arrived at the science of man, and, at the same time, at man's place in the system of nature. "The ascertainment of the place which man occupies in nature and of his relations to the universe of things," Huxley (in the work cited, p. 71) characterizes as "the question of questions for mankind—the problem which underlies all others, and is more deeply interesting than any other." Our classification shows us that man occupies the highest position in the highest order in the highest class of the highest kingdom of tellurology; but, after all, tellurology relates but to the earth, a small planet of a small solar system; after all, man is only as a drop in the ocean of infinity, of *value*, but of *relative* value. To the tiger, man is a mass of flesh and bone, partly food and partly indigestible matter; to man himself, he is the first and most important compound of physical, intellectual and moral attributes, a sentient, knowing and acting being. Anthropology concerns itself with everything that pertains to man, his origin, his structure and functions, his relations and capabilities, his conditions in health and disease, his needs and desires, his religion and morals. In addition to the aspectual divisions already named, giving us general and special anthropology; comparative and descriptive anthropology; anthropogeny (embracing history of the past) and anthropography (embracing statistics of the present); anthropohylology, anthropodynamology and anthropomorphology;—there is another aspect from which the science of man may be studied, viz., that of man's being either alone, separate, individual or not alone, but combined, *i.e.*, in society; and hence arises the further aspectual subdivision of anthropology into monanthropology, a name for which science is indebted to STEPHEN PEARL ANDREWS, and synanthropology, a name which I propose instead of that of sociology, introduced by AUGUSTE COMTE. To specify the many other sciences included under the head of anthropology, I deem unnecessary.

ELSBERG'S CLASSIFICATION

MATHESIS.
- ……….SCIENCE……….
  - 1. GENERAL.
  - 2. SPECIAL.
  - 1. *Comparative.*
  - 2. *Descriptive.*
  - ……………….A. Concrete Science:
    (Distinguishing suffix
    - a. Developmental: Physogeny.
      (Distinguishing Suffix "ogeny.")
    - β. Existential: Physography.
      (Distinguishing Suffix "ography.")
    - a. As to
    - b. As to
    - c. As to
  - ……….. ……B. Abstract Science:
    (Distinguishing suffix
- ART.

a
- 1. Concerning Living Beings: Biology…….
  (including the died.)
  - 1. Pertaining to the Animal Kingdom: Zoo
  - 2. Pertaining to the Vegetable Kingdom : V
  - 3. Pertaining to the Protistic Kingdom: P
- 2. Concerning Unliving Beings: Abiology.
  (excluding the died.)

b
- 1. Of the Lung-breathing Division: Pulmonatology………
  - 1. Of the Mammalian Class:
  - 2. Of the Bird Class: Aviol
  - 3. Of the Reptilian Class: I
- 2. Of the Gill-breathing Division: Branchiatology.

c
- 1. Of the Legion of Disk-placentals: Discoplacentalology….
  - 1. Of the Order of Primates
  - 2. Of the Order of Subprim
  - 3. Of the Order of Prosimia
- 2. Of the Legion of Girdle-placentals: Zonoplacentalology.
- 3. Of the Legion of Papilla-placentals: Villiplacentalology.

NOTE.—Subdivisions embraced by brackets in different positions are on different p
vertical bracket, viz.: { to "departmental subdivision," as explained in the text, p.280.

*The resort to this device for showing the continuous subdivisions

XXVII.—*On Prophysaon, a new Pulmonate Mollusk, on Ariolimax, on Helix lychnuchus and other species.*

BY THOMAS BLAND AND W. G. BINNEY.

Read April 28, 1873.

Description of **Prophysaon**, *a new Genus of Pulmonate Mollusk.*

ANIMAL limaciforme, postice acuminatum. Pallium antice positum, parvum, obtusum, marginibus anterioribus liberis, testam simplicem, haud spiralem includens. Margo infera animalis sulco longitudinali supra pedem posito instructa. Discus distinctus gressorius nullus. Apertura respiratoria et analis ad marginem dextram pallii paululum anteriorem positæ. Apertura genitalis ad latus dextrum, pone et infra tentaculum oculigerum. Porus mucosus caudalis nullus.

Testa interna longa, subhexagonalis.

Maxilla leviter arcuata, costis numerosis validis (in specie unica circa xv), confertis munita; marginibus denticulatis.

Lamina lingualis ut in Helice constituta. Dentes medianæ tricuspidatæ, laterales bicuspidatæ, marginales quadratæ, irregulariter cuspidatæ.

Habitat in Oregon et in California. Specimina plurima collegit H. Hemphill de Astoria usque ad San Francisco.

Genus *Limaci*, *Arioni* et *Ariolimaci* affine, sed facile distinguendum. *Limaci* affine est testa interna, et positione aperturæ genitalis; sed differt maxilla costata, dentibus lingualibus marginalibus subquadratis, et positione aperturæ respirationis. *Arioni* simile est genus maxilla costata, dentibus lingualibus marginalibus et positione aperturæ respiratoriæ; sed differt testa interna, positione aperturæ genitalis, et poro mucoso carente. *Ariolimaci* affine est maxilla costata, dentibus marginalibus quadratis lingualibus, et testa interna; sed differt positione aperturarum, respiratoriæ et genitalis, et poro mucoso carente. De omnibus generibus supra comparatis differt etiam nostrum genus carente disco gressorio distincto.

De genere Hibernico *Geomalaco* differt carentibus poro mucoso caudali, disco distincto gressorio, et positione pallii et aperturæ respiratoriæ (in *Geomalaco* valde anteriore); affine est testa interna, dentibus quadratis marginalibus lingualibus. Maxilla *Geomalaci* (vide infra, p. 309).

Ab ceteris generibus Americanis sat distinctum est.

Animal (see pl. xiii, fig. 8) limaciform, attenuated behind. Mantle anterior, small, obtuse before and behind, its margins free as far back as the cleft for the respiratory orifice, enclosing a simple, not spiral, subhexagonal shell, which is longer

than wide. A longitudinal line around the animal just above the edge of foot. No distinct locomotive disk to foot, but crowded, oblique furrows running from centre to edge. Respiratory and anal orifices on the right margin of mantle, slightly in advance of its centre, with the usual cleft to the edge. Genital orifice behind and below, but quite near to, the right eye-peduncle. No caudal mucus pore.

Jaw slightly arcuate, ends blunt, but little attenuated. Anterior surface with numerous (about fifteen in the only known species) crowded, stout ribs, which denticulate either margin (see pl. xiii, fig. 4).

Lingual membrane (pl. xiii, fig. 7) as usual in the genus *Helix*. Central teeth tricuspid. Laterals bicuspid. Marginals quadrate, irregularly cuspid, the inner cusps, as usual, longest.

Found in Oregon and California. Mr. Henry Hemphill has collected specimens from Astoria to San Francisco Bay.

This genus agrees with *Limax* by having an internal shell, and by the position of the genital orifice. It differs by its ribbed jaw, by the subquadrate marginal teeth of the lingual membrane, and by the anterior position of its respiratory orifice. The genus is allied to *Arion* by its ribbed jaw, its quadrate marginal teeth of the lingual membrane, and by the anterior position of its respiratory orifice; it differs in having an internal shell, in the position of its generative orifice and by the want of a caudal mucus pore. The genus is also allied to *Ariolimax* in having a ribbed jaw, quadrate marginal teeth to its lingual membrane and an internal shell; it differs in the position of both genital and respiratory orifices, and by the want of a caudal mucus' pore. The absence of a distinct locomotive disk to the foot distinguishes our genus also from *Arion*, *Limax* and *Ariolimax*. It is not readily confounded with any other known American genus. The Irish genus *Geomalacus* is somewhat allied, having an anterior respiratory orifice and an internal shell, and being said by Gray to have crowded, quadrate teeth as in *Helix*, from which we presume the marginals are quadrate, not aculeate. *Geomalacus*, however, differs from *Prophysaon* in having an extremely anterior mantle and orifice of respiration close behind the right tentacle. It also has a locomotive disk and caudal mucus pore. It is described below, p. 309.

Prophysaon Hemphilli. n. s.

From specimens preserved in alcohol we can draw the following description only. Body blunt anteriorly, attenuated posteriorly, rounded and high on the back. Mantle granulated, whitish with a circular ring of smoke color above the respiratory orifice. Body obliquely reticulated with bluish lines, the reticulations larger (about twelve) below each side of the mantle, more numerous and smaller on the posterior extremity of the body. These reticulations are subdivided by irregularly disposed, rounded tuberosities, with colorless interstices. Above the foot, from the longitudinal line running around the animal to the edge of the foot, are perpendicular lines or furrows, also bluish in color. The foot has crowded wrinkles, running obliquely backwards from its centre to its margins. Length of an alcoholic specimen 40 mill.

Astoria, Oregon: Oakland and Mendocino Co., California (Mr. Henry Hemphill).

The internal shell (pl. xiii, fig. 2) differs in thickness, but is always well marked, sometimes suboval, sometimes subhexagonal, always longer than wide.

The jaw and lingual membrane have been described above.

The genitalia* are figured on pl. xiii, fig. 6. The testicle is composed of black aciniform cœca; it is almost completely buried in the upper lobes of the liver, the epididymis completely so, lying on the floor of the cavity formed by the spiral winding of the upper lobes. It appears to pass through one of the lower lobes to join the oviduct, before reaching which it is greatly convoluted. The accessory gland of the epididymis appears to be composed of several aciniform cœca of unequal size. The prostate gland is large. The vas deferens is extremely long, ten times as long as the penis, and equals the length of the whole genital system. It is attached to the side of the vagina quite to the penis, where it becomes free, and is spirally wound. It is largest about half-way from the vagina to the apex of the penis. It enters the penis at the centre of its truncated apex. The penis is very short and stout, barrel shaped, of equal breadth throughout. It has no retractor muscle. The cloaca is very short. On the vagina, just above the penis, appears on some specimens an extremely small, sac-like organ, not figured in our plate, as we are not entirely satisfied as to its presence. It is perhaps a dart sac, or a prostate. The ovary has the usual tongue-shaped form. The oviduct is not much convoluted. The vagina is long, and extremely broad, several times convoluted. The genital bladder is oval, small, with a short, stout duct entering the vagina at its upper extremity, by the side of the terminus of the oviduct.

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*I alone am responsible for the descriptions of the anatomy.—W. G. B.

This peculiarly stout, barrel shaped penis and broad vagina were constant in eight specimens examined, all from Astoria. In several other specimens from Mendocino County, easily detected exteriorly by a more slender, tapering body, and smaller, more rounded mantle, the penis was found more elongated, the vagina less broad, the genital bladder larger, with a more delicate duct. In these specimens, also, the testicle was very much larger and was not concealed in the liver, but only slightly entangled in it at one point, against which it lay. The epididymis in these specimens was also free from the liver. The genitalia of this form differ enough from those of the Astoria specimens to warrant our belief in the existence of a second species of *Prophysaon*. We have therefore figured, also (fig. 5), the genital system of the Mendocino County specimens. The question of specific identity must be settled by those who can study living specimens. The digestive system of the same form is figured on pl. xiii, fig. 3. It quite resembles that of *Arion hortensis* as figured by Leidy in Terrestrial Mollusks, Vol. I. It is much more simple than that of *Ariolimax*. The salivary glands are very broad and very arborescent, and form a broad collar around the œsophagus and commencement of the stomach. The last named organ is very broad.

Before deciding that this slug is new to science we compared it with the descriptions of *Arion foliolatus*, Gould (Terr. Moll. U. S., II, 30, pl. lxvi, fig. 2) and *Arion? Andersonii*, J. G. Cooper (Proc. Phila. A. N. S., 1872, 148, pl. iii, fig. F, 1–5). Our species cannot be identical with the former, which is described as an *Arion*, with "a conspicuous pit, which probably was occupied by a mucus gland" at the truncated tip of the tail. The areolæ formed by the reticulating lines of *A. foliolatus* are said to have their surfaces indented by leaf-like markings, no doubt the same as the granulations between the reticulations of *Prophysaon*. In our genus, however, the granulations seem less regularly arranged. The figure of *Arion foliolatus** shows, also, a larger mantle, which leaves a much smaller space between its lower margin and the longitudinal furrow above the foot, than does the mantle in our species.

At first sight it seemed as if our species might be identical with *Arion? Andersonii*, but that species is described and figured with a distinct locomotive disk, with the respiratory orifice perceptibly anterior only when the animal is fully extended, with a jaw having 20–30 ribs, with a minute caudal mucus pore and with the generative orifice half-way between the tentacle and the mantle, all of which does not apply to *Prophysaon Hemphilli*.

We deem it necessary, therefore, to find a specific as well as generic name for our slug, and take pleasure in adopting that of Mr. Henry Hemphill, who has given us so much assistance in our studies of the land shells of the Pacific Coast.

On the Generic Chavacters of **Ariolimax.**

Having received from Mr. J. G. Anthohy, of the Cambridge Museum of Comparative Zoology, a specimen of the true *Ariolimax*, probably the *A. Californicus*, we are en-

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* Fig. *b* of the Ex. Ex., shows the respiratory orifice behind the centre of the mantle edge.

abled to give a more full description of the genus than that contained in our Land and Fresh Water Shells of North America.

ARIOLIMAX. Animal limaciforme, postice acuminatum. Pallium antice situm, parvum, obtusum, marginibus liberis, testam simplicem haud spiralem, solidam includens. Margo infera animalis sulco longitudinali supra pedem posito munita. Discus gressorius distinctus. Apertura respiratoria ad marginem dextram pallii in parte posteriore posita; apertura analis vicina, sed postice et infra posita. Apertura genitalis ad latus dextrum corporis, sub parte anteriore libera pallii posita (in *A. Californico* duobus orificiis distinctis munita). Porus mucosus caudalis triangularis erectus supra apicem pedis.

Maxilla leviter arcuata, costis numerosis (viii-xx), validis, confertis munita; marginibus denticulatis.

Lamina lingualis ut in Helice constituta. Dentes medianæ tricuspidatæ; laterales bicuspidatæ; marginales quadratæ, irregulariter cuspidatæ, cuspide interna producta, externa sæpissime subobsoleta.

Habitat in regionibus Pacificis Statuorum Unitorum, inter Oceanum et montes "Cascade" et "Sierra Nevada" dictas, de lat. 34° usque ad 49°.

Genus a cl. Mörch primo descriptum, Mal. Blatt. VI, 110, Oct., 1859; postquam a W. G. Binney Amer. Journ. Conch. I, 48, pl. vi, fig. 11–13, 1865; deinde, W. G. Binney et T. Bland, L. and F. W. Shells N. A., I, 278, f. 496–8, 1869. Ceteris auctoribus ad *Limacem* refertur: Gould in Terr. Moll. U. S. II, 1851; W. G. Binney ante, Terr. Moll. IV, 1859; Tryon, Am. Journ. Conch., III, 315, 1868.

Genus *Limaci*, *Arioni* et *Prophysaonti* affine, sed facile distinguendum. *Limaci* affine est testa interna, positione aperturæ respiratoriæ, et disco gressorio distincto; sed differt poro mucoso caudali, maxilla costata, dentibus marginalibus quadratis laminæ lingualis, et positione aperturæ genitalis. *Arioni* simile poro mucoso caudali, disco gressorio distincto, maxilla costata, lamina linguali, positione aperturæ genitalis; sed differt positione aperturæ respiratoriæ, et testa interna. *Prophysaonti* simile testa interna, maxilla costata, lamina linguali; sed differt positione aperturarum, respiratoriæ et genitalis, disco gressorio distincto, et poro mucoso caudali.

Ab ceteris generibus Americanis limaciformibus aut sublimaciformibus, *Veronicella*, *Binneia*, *Hemphillia*, *Tebennophoro* et *Pallifera* sat distinctum est.

Species adhuc notæ: —

Ariolimax Columbianus, GOULD (*Limax*), Terr. Moll. U. S., II, 43, pl. lxvi, fig. 1. *Conf.* BINNEY et BLAND, L. and F. W. Shells N. A., I, 279.

Ariolimax Californicus, J. G. COOPER, Proc. Acad. Nat. Sci., Phila., 1872, p. 146, pl. iii, fig. D, 1–3.

Ariolimax niger, J. G. COOPER, *l. c.*, 147, pl. iii, fig. E, 1–4.

Animal limaciform, blunt in front, pointed behind. Mantle anterior, small, bluntly truncated before and behind, free around its edges, containing a well defined, solid, testaceous plate. A longitudinal furrow along the sides above the foot. A distinct locomotive disk. Respiratory orifice at the posterior third of the mantle, with a cleft to its right margin. Anal orifice contiguous to the last, slightly below and behind it. Orifices of generation on the right of the body, below the anterior, free part of the mantle, distinct but contiguous (in *A. californicus*, certainly), that of the male organ anterior. Tail furnished with a perpendicular, triangular mucus pore, with a horizontal mucus slit to the end of the tail.

Testaceous plate flat, thick, calcareous, simple, not spiral; longer than wide, hexagonal.

Jaw (see L. and F. W. Shells, p. 278, fig. 497) slightly arcuate, with numerous (from eight to twenty in the several species) stout, crowded ribs, denticulating either margin.

Lingual membrane (see L. and F. W. Shells I, p. 279, fig. 498) as usual in *Helix*. Teeth in numerous horizontal rows; centrals tricuspid; laterals bicuspid; marginals (see our plate xiii, fig. 1) quadrate, irregularly denticulated, the inner cusp the largest.*

Inhabits the Pacific Coast of the United States, at least from lat. 34° to 49°, apparently not eastward of the Sierra Nevada and Cascade Ranges.

The species on which the genus was founded has been known for many years as a *Limax* (see Gould in Terr. Moll. U. S., II, III and Ex. Ex. Mollusca, where an additional figure is given), but it was not until 1859 that Mörch (Mal. Blatt. VI, 110) recognized it to be distinct from *Limax* and proposed a generic name, *Ariolimax*. In 1865, W. G. Binney (Amer. Journ. Conch. I, p. 48, pl. vi, figs. 11–13) gave a more detailed generic description, adding figures of

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*In only one instance have we seen marginal teeth as in our figure. In all other specimens examined the marginals are as figured in L. and F. W. Shells, *l. c.*, with one long cusp and one obsolete side cusp.

jaw and lingual dentition. These were also given in our Land and Fresh Water Shells N. A., I, p. 278, figs. 496–8 (1869). As late as 1868 the species is still retained in *Limax* by Tryon (Amer. Journ. Conch. III, 315), who gives a copy of one of Gould's figures from the Terrestrial Mollusks.

The genus has affinities with, but is readily distinguished from, *Limax*, *Arion* and *Prophysaon*. It agrees with *Limax* in having an internal shelly plate, in the position of its respiratory orifice and its distinct locomotive disk; but it differs in having a caudal mucus pore, a ribbed jaw, quadrate (not aculeate) marginal teeth on the lingual membrane, and in the position of its genital orifice. With *Arion* it agrees in having a mucus pore, a distinct locomotive disk, a ribbed jaw, in its lingual membrane, and position of the genital orifice; but it differs in the position of its respiratory orifice and its internal shell. With *Prophysaon* it agrees in having an internal shell, a ribbed jaw, in its lingual membrane; but differs in the position of the genital and respiratory orifices, in its distinct locomotive disk and caudal mucus pore.

From the other sluglike, or semi-sluglike American genera, *Tebennophorus*, *Pallifera*, *Binneia*, *Hemphillia*, *Veronicella*, it is most readily distinguished.

Several species are known:—

Ariolimax Columbianus, Gould (*Limax*) see L. and F. W. Shells, I, 279, for its synonymy, to which must be added *Limax Columbianus*, Tryon, Amer. Journ. Conch., III, 315, pl. xvi, fig. 1, copy. (1868.) This is found in Washington Territory and Oregon, confined, according to Dr. Cooper, to the west of the Cascades.

Ariolimax Californicus, J. G. Cooper, Proc. Phila. Acad. Nat. Sci., 1872, p. 146, pl. iii, fig. D, 1–3. California, in the Coast Range, once only in the Sierra Nevada in lat. 39°.

Ariolimax niger, J. G. Cooper, *l. c.* 149, pl. iii, fig. E, 1–4. San Francisco Bay. An examination of the original specimens belonging to the State collection of California convinced us of this being a distinct species. The anatomy, especially the genitalia, of these species varies greatly, as we hope to show in a future paper.

On the Generic Position of **Helix lychnuchus**, *Müll.*

Prominent among the group of Helices known as *Dentellaria* is *Helix lychnuchus*, Müller, a species well known from its characteristic shell. Though its specific identity is unquestioned, it has been less fortunate with respect to generic position. From an examination of the generative organs and jaw, this species was referred by M. de St. Simon (Journ. de Conch. III, p. 227, Aug., 1853) to the genus *Zonites*. So positively was this determination made that it has been accepted by subsequent authors, either absolutely or to a degree sufficient to throw doubt upon the species being a true *Helix*. Thus in the second edition of Albers' "Die Heliceen," p. 79, there is a paragraph fixing the place it would hold as a distinct genus among the *Vitrinea*, should St. Simon's observations be confirmed; and quite recently we find it singled out by Messrs. Fischer and Crosse (Moll. Mex. et Guat., p. 205) as an instance of the shell of a terrestrial mollusk being unreliable in indicating generic position.

Early in our studies of the classification of land shells, we were inclined to doubt the correctness of St. Simon's decision. On consulting his paper (p. 234) we noticed that he placed *Helix lychnuchus* in *Zonites* simply because he accepted Moquin-Tandon's decision that *Zonites* is generically distinct from *Helix*, in having (1) a jaw without ribs or marginal denticulations and with a median rostriform projection to its cutting edge; and (2) by the absence of dart, dart sac and multifid vesicles in the generative system. We had satisfied ourselves that this distinction does not exist, and even at the time of writing his article, St. Simon might have learned from the first volume of the "Terrestrial Mollusks of the United States" that many *Helices* have the most simple form of genitalia, while several true *Zonites* have the dart, dart sac, and some form of multifid vesicle. As to the presence or absence of ribs upon the jaw, or a median projection to its cutting edge, we were well aware from our own observations that those characters were valueless for the purposes of distinguishing *Zonites* from *Helix*. Our doubts as to the correctness of the reference by St. Simon of *Helix lychnuchus* to *Zonites*, were confirmed on finding the allied species* of the subgenus *Dentellaria*, *H. orbiculata*, Fer., *Isabella*, Fer., *dentiens*, Fer., and *perplexa*, Fer., to be true *Helices*. All of those species have the quadrate marginal teeth which characterize the genus *Helix*, while, as is well known, the genus *Zonites* is characterized by aculeate marginal teeth. Moreover we did not observe in any of the above species the marginal furrows above the edge of the foot, the distinct locomotive disk, or the caudal mucus pore prevailing in *Zonites*.

Confident, therefore, that the species would prove a true *Helix*, we have for some time endeavored to obtain specimens of the animal, but have only recently succeeded in so doing. Through the kindness of Mr. A. Schramm we are in receipt of several specimens preserved in glycerine, from Guadeloupe. On examination of these specimens we find, from both external and internal characters of the animal, that our surmises are corroborated in every particular. The species, therefore, animal as well as shell considered, must remain in *Helix*, as now accepted by von Martens and most authors.

Helix lychnuchus. Lingual membrane (pl. xiv, figs. 7, 8), long and broad. Teeth arranged in numerous horizontal rows. Centrals tricuspid, laterals bicuspid, the side cusps of each being subobsolete; marginals quadrate, low, wide, the upper margin reflected along its whole length and produced into two oblique, broad, bluntly rounded cusps, the inner one bluntly bifid.

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* Two more of this subgenus are described below in this paper, p. 305, 306.

Jaw (see pl. xiv, fig. 5) arched, high, ends blunt, scarcely attenuated; concave margin with a broad, blunt, median projection. Upper margin showing slightly the ends of subobsolete ribs, whose presence is scarcely discernible on the anterior surface. Strong perpendicular striæ, and stout transverse lines of reinforcement.

We have also examined the genital system and find it apparently as described by M. St. Simon (*l.c.*). Its characteristic is the long, flagellate penis, and long, large duct to the genital bladder. (See pl. xiv, fig. 6.) The external orifice of the generative organs seems, as stated by M. St. Simon, to be under the mantle, not far in advance, on the side of the neck, behind the right tentacle. See our remarks on the value of this character in Ann. N. Y. Lyc. Nat. Hist., X, p. 165.

It is interesting to state in this connection, that we have already rescued from a similar misapprehension one species of the genus *Leucochroa* (*L. Boissieri*, see Ann. of N. Y. Lyc. Nat. Hist., X, p. 220), a genus separated from *Helix* on the same grounds as *Helix lychnuchus* was referred to *Zonites*. We cannot refrain from believing that all the species referred to *Leucochroa*, including *L. candidissima*, will be proved to have quadrate marginal teeth.

The species allied to *Helix lychnuchus*, also referred to *Dentellaria*, *H. Isabella* and *H. dentiens*, have decidedly costate jaws; *H. orbiculata* and *perplexa* have only some approach to ribs on their jaws; the last mentioned has a broad median projection. All of them have on their lingual membranes marginal teeth of the type described above in *Helix lychnuchus*.*

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* The habitat given of this species, in Albers, 2d ed. (Porto Rico), is unquestionably erroneous. It is by no means uncommon in Guadeloupe, and Pfeiffer refers it also to Martinique, but we have not seen any authentic specimen from that island.

On the Specific Distinction of **Helix Columbiana,** *Lea, and* **Helix germana,** *Gould.*

We have hitherto found difficulty in separating certain forms of *Helix Columbiana*, Lea, and *Helix germana*, Gould, but have recently received, through the kindness of Mr. Henry Hemphill, specimens of both species, preserved in alcohol, from several distinct localities. An examination of their soft parts has proved that in the jaw and genital system there exists a specific difference readily detected. This difference appears to be constant, as we have observed it in one specimen, with parietal lamina and quite depressed, of *Helix Columbiana*, from San Leandro, California, and three from another locality. In *Helix germana* we also have found the characters constant, having examined four specimens, one from Astoria, the other three from a separate locality.

In the jaw, the distinction is in its general outline and in the size and frequency of the ribs on the anterior surface. In *H. germana* the jaw is slightly arcuate (see pl. xiv, fig. 4); the ribs are about eleven in number, broad, crowded, with narrow interstices only, generally resembling the jaw found in the subgenus *Stenotrema* (see our L. and F. W. Shells N. A., Part I). In *Helix Columbiana* (pl. xiv, fig. 2) the jaw is more arched, the ribs are less numerous, about eight, narrower, much more separated, and more decidedly produced on either margin, as usual in *Mesodon*.

In the genitalia the difference lies in the genital bladder. This organ in *Helix Columbiana* is clavate, short, with a short, stout duct (fig. 1, *a*) but in *Helix germana* (fig. 3, *a*) it is globular and has a long, narrow duct.

In both species the retractor muscle of the penis is attached

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NOTE. In L. and F. W. Shells N. A., Part I, 120, we included *H. germana* in *Stenotrema*, but it has not the internal transverse tubercle characteristic of that subgenus. In the foregoing remarks we have shown that *H. germana* differs specifically from *H. Columbiana*, but consider that both species belong to *Mesodon* rather than the latter to *Stenotrema*.

to the vas deferens, a short distance before the latter organ enters the penis, which it does at the apex of the penis sac.

Macrocyclis Baudoni, Petit.

We have already described the lingual membrane of this species. (See Am. Journ. Conch., VII, p. 175.) Recently we have received a Guadeloupe specimen (not adult), from Mr. Schramm. On extracting the lingual membrane we found attached to it a most delicate, transparent, colorless jaw, arched, with pointed ends, median projection to cutting edge and smooth anterior surface.

This, added to the lingual dentition, places the species in *Macrocyclis*.

Bulimulus multifasciatus, Lam. (*Liostracus.*)

Antigua. Governor Rawson.

Jaw long, very low, slightly arcuate; ends attenuated, pointed; extremely thin, transparent; divided by numerous delicate ribs into over thirty plates of the form common to *Bulimulus*, *Cylindrella*, etc., the upper median plates triangular.

Lingual membrane broad. Teeth in numerous waving rows, of the type we have described and figured in *Bulimulus laticinctus*. (Ann. Lyc. Nat. Hist., N. Y., X, p. 81, pl. ii, fig. 1, 5.) The centrals are distinctly trifid.

Bulimulus alternans, Beck. (*Liostracus.*)

Islands in the Bay of Panama. Mr. McNiel.

Jaw long, low, slightly arcuate, extremely thin and transparent; divided by numerous delicate ribs in about fifty-two plates of the type common in *Bulimulus*, *Cylindrella*, etc.

Lingual membrane as in the preceding species.

Helix pachygastra, Gray. (*Dentellaria.*)

Guadeloupe. Mr. Schramm.

Jaw stout, slightly arcuate, ends blunt; anterior surface with decided ribs, denticulating either margin, about seven, irregularly disposed; both ends free from ribs.

Lingual membrane as usual in the subgenus; see above, p. 303 and plate xiv, figs. 7, 8, for those of *Helix lychnuchus*.

Helix Josephinæ, Fér. (*Dentellaria.*)

Guadeloupe. Mr. Schramm.

Jaw stout, ribless; so strongly arched as to be quite horse-shoe shaped. Ends bluntly rounded. A decided median projection to cutting edge, marked with strong vertical striæ.

Lingual membrane as in preceding.

Helix invalida, Adams. (*Pleurodonta.*)

Jamaica. Mr. Henry Vendryes.

Jaw not examined.

Lingual membrane as in the preceding. The centrals and laterals quite short and stout.

Punctum minutissimum, Lea.

This species was described as *Helix minutissima* by Mr. Isaac Lea, in 1841. Its proper generic position was unknown, however, prior to 1864, when Professor Edward S. Morse, published figures of the jaw and lingual dentition (Journ. Portland Soc., I, p. 27, fig. 70, pl. viii, fig. 71).

He thus described the jaw:—

> "The buccal plate (fig. 70) is made up of sixteen long, slender, corneous laminæ, recurved at their cutting edges, these plates partially lapping over each other."

Morse remarked on the similarity between Lea's species and *H. pygmæa* Drap., of Europe, adding, "and it seems singular that it has never been referred to that species," but after examination of the jaw of the latter, as figured by Moquin-Tandon, Morse considered it generically distinct.

The following is Moquin-Tandon's description of the jaw of *H. pygmæa* (Moll. de France, II, p. 103, pl. x, fig. 2, 1855).

> "*Mâchoire* large de $0^{mm}.25$, peu arquée, mince, à peine cornée, transparente, assez facile à étudier à cause de la transparence des téguments; extrémités amincies; partie moyenne du bord libre un peu surbaissée; côtes verticales nombreuses, fines, serrées; crénelures très pétites."

In W. G. Binney's Synopsis (Smith. Inst. Coll., p. 4, Dec., 1863) *Hyalina* (*Conulus*) *minutissima*, Lea, is enumerated, and Tryon (Amer. Jour. Conch., II, p. 257, 1866) placed the species in *Conulus*, while quoting the particulars given by Morse, of the jaw.

In 1868, Lindström (Gotlands Nut. Moll., taf. iii, f. 12) published figures, but without description, of the jaw of *H. pygmæa*. On comparison of this with Morse's figure of *minutissima*, the identity of the two species could scarcely be inferred.

In our Land and Fresh-water Shells (Part I, p. 221, 1869) we adopt *Punctum*, Morse, as the generic name of Lea's species, treating that genus as belonging to *Orthalicinæ*, by reason of the structure of the jaw.

W. G. Binney (Invert. Mass. 2d ed., p. 403, fig. 665, 1870) has *Hyalina minutissima* as occurring in Massachusetts, adding in a note "the character of the jaw would place the species in the subfamily *Orthalicinæ*, as a distinct genus for which Morse's name *Punctum* might be retained, otherwise the species would be placed in *Hyalina*."

Mr. J. Gwyn Jeffreys (Ann. & Mag. Nat. Hist., Oct., 1872) refers to *Hyalina minutissima* as being identical with *Helix pygmæa*, Drap.

Dr. G. Schacko (Malak. Blatt., p. 178, 1872) has recently described both jaw and lingual teeth of *H. pygmæa*, showing that both have the same characters as ascribed by Morse to *Punctum minutissimum*.

The following is a translation of Schacko's description of the jaw of *H. pygmæa:*—

"The jaw consists of nineteen plates, which are grouped in the form of a horse-shoe. They lie together like the tiles of a roof, and partially cover one another. The plates are connected by a fine transparent membrane. The middle plate, which is the largest, and perfectly straight at the top, lies entirely alone, so that a space is visible between it and the two next side-plates. These are smaller and of the same length, while the top is slightly curved. The plates have the same form as regards their length, but the curve increases towards the end plates. The third

plate from the middle begins to cover the second, the fifth covers half of the fourth, and the succeeding plates always more, until the last covers two-thirds of the preceding one."

The formula of the lingual membrane is given by Schacko as being one hundred and fourteen rows of 19–1–19; by Morse of Lea's species, fifty-one rows of 13–1–13.

The centrals of *H. pygmæa* are said by Schacko to be tricuspid; the two side centrals so small, and scarcely recognizable, that they entirely disappeared in one specimen; the laterals bicuspid. He remarks that every tooth of the radula lies alone, so that even the cusps do not cover or disturb the basal surfaces of the overlying rows.

Schacko refers to the near alliance, in form of jaw especially, of *H. pygmæa* with *H. minutissima* of the genus *Punctum* of Morse.

Looking at the descriptions and figures of the jaws of *pygmæa* and *minutissima*, we notice, with striking general similarity of characters, some differences; on the other hand the lingual teeth of the two forms appear to be the same, and the shells without variation of specific value.

The facts regarding the distribution of *H. pygmæa*, which may be treated as one of the circumpolar species, favor the opinion, which we are disposed to adopt, that Lea's specific name must be placed in the synonymy of *Punctum pygmæum*.

The species known as *H. pygmæa*, Drap, has an extensive range in northern (Lapland, Denmark, etc.) and central Europe. The North American form occurs in California, also in Maine, Massachusetts, New York and Ohio, and has lately been discovered by Mr. Hugo W. Ericsson, in Bosque County, Texas.

Geomalacus maculosus, Allm.

On p. 293 of this article we compared *Prophysaon* with the Irish genus *Geomalacus*, as far as known to us by published descriptions.* Since then we have received through the kindness of Mr. Gwyn Jeffreys six specimens, preserved in spirit, of *Geomalacus maculosus*, Allm. This enables us to give the following description and figures.

Jaw (fig. A), high, stout, dark horn-colored, arched, ends but little attenuated, bluntly rounded; anterior surface with about twelve, broad, crowded ribs, of which four on the middle part of the jaw are stout, well developed, denticulating either margin, and produced below so as to give the appearance of a median projection to the cutting edge: the remainder of the ribs are unequally developed in the several specimens examined, being sometimes scarcely discernible; on one specimen is a median, transverse line of reinforcement, parallel to the margins of the jaw.

Lingual membrane long, not very broad. Teeth arranged in horizontal rows, of the form common to the *Helicinæ*. Centrals (fig. B) tricuspid, laterals (Fig B) bicuspid, the external cusps of each being subobsolete. Marginals (Fig. C) quadrate, with one long inner oblique, pointed cusp, and one outer, small, pointed cusp. Extreme marginals lower than wide, but retaining the same bicuspid character.

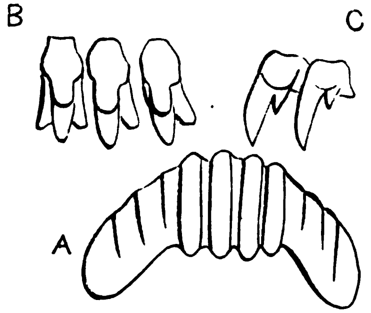

Fig. A gives an enlarged view of the jaw. B gives one central and two lateral teeth of the lingual membrane. C gives several marginals.

The genitalia are as usual in the limaciform *Helicinæ*. The testicle is black, embedded in the upper lobe of the liver, connected by a long epididymis to the oviduct. The ovary is tongue shaped. The oviduct is convoluted. The genital bladder is small, round, with a long, delicate duct. The vas deferens is twice as long as the whole genital system, four times as long as the penis sac, which it enters at its apex. This sac is cylindrical, stouter and longer than the vagina; the retractor muscle is inserted opposite the entrance of the vas deferens, beyond which point the sac is extended in a short delicate duct, which enters a large ovate organ, one-third the length of the penis sac. This organ is the peculiar characteristic of the species, present in all the six specimens examined. It no doubt is of the same use as the bulb-like termination sometimes found to the flagellum in other species, but is of extraordinary dimensions.

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* Owing to our copy of Nachrichtsbl. mal. Gesellsch. being imperfect, the description of Heynemann I, p. 165–168, pl. i, fig. 1, is known to us only from the notice in the Zoological Record, VI, p. 565.

EXPLANATION OF PLATES XIII AND XIV.

The separate organs of the anatomical figures will readily be recognized, or may be compared with the figures in "Terrestrial Mollusks U. S.," I.

Plate XIII.

Fig. 1. *Ariolimax niger*. The extreme marginal teeth. See p. 299, foot note.

Fig. 2. *Prophysaon Hemphilli*. The internal shell enlarged.

Fig. 3. The same. Digestive system. Same form as fig. 5.

Fig. 4. The same. The jaw greatly magnified.

Fig. 5. The same. The genitalia of the form referred to on p. 296. *a*, the genital bladder.

Fig. 6. The same. The genitalia of the typical form, still more enlarged.

Fig. 7. The same. Central, lateral and marginal teeth of the lingual membrane.

Fig. 8. The same. External view of a specimen contracted in spirits. Magnified.

Plate XIV.

Fig. 1. *Helix Columbiana*, Lea. The genitalia. *a*, the genital bladder.

Fig. 2. The same. Jaw.

Fig. 3. *Helix germana*, Gld. The genitalia. *a*, the genital bladder.

Fig. 4. The same. Jaw.

Fig. 5. *Helix lychnuchus*, Müll. Jaw.

Fig. 6. The same. Genitalia. The accessory gland of the epididymis is not shown in the figure. It was broken off.

Fig. 7. The same. A group of central and lateral teeth of the lingual membrane.

Fig. 8. The same. Marginal teeth from the left of the median line of the lingual membrane.

XXVIII.—*On the Physical Geography of, and the Distribution of Terrestrial Mollusca in, the Bahama Islands.*

BY THOMAS BLAND.

Read April 28, 1873.

THE northern end of the extensive and remarkable group called the Bahama, or Lucayos Islands, lies opposite southern Florida, and from this point the islands stretch off in a double series, nearly parallel to the trend of Cuba and San Domingo, and terminate properly in the Turk's Island Bank, on which are the last, and most easterly, of this chain of inhabited islands, which extends about 600 miles, from within 70 miles of the coast of Florida, to within 100 miles of that of San Domingo.

The following brief description of the Banks and Islands, defined generally by the 100-fathom line of soundings, is taken principally from the valuable "Report on the Bahamas," by Governor Rawson, which report accompanied the official "Blue Book". of that colony, for 1864; the soundings from the charts issued by the U. S. Coast Survey, and the Hydrographic Office of the U. S. Navy.

The Little Bahama Bank.—This is the most northerly bank; its northwestern point, Matanilla Reef, is 70 miles from the Florida shore, separated from it by the Gulf of Florida, the greatest depth of which, on the line of the axis of the Gulf Stream, off the western edge of the Reef, is 344 fathoms (2,064 feet). The area of the Bank is about 5,560 square miles, of which the islands occupy about 1,200; it is separated from the Great Bahama Bank by the northwestern and northeastern Providence Channels, but is not more than 45 miles from any part of it; at the nearest point only 15 miles.

The Little Bank contains only two islands of considerable size; Abaco (divided by a narrow channel into Great and Little Abaco) and Grand Bahama. "Hole in the Wall," at the southeast end of Great Abaco, is 568 miles distant from Cape Hatteras.

The Great Bahama Bank.—This Bank, south and southeast of the Little Bank, is separated from it by the Providence Channels, from Florida by the Gulf of Florida, by the Santaren Channel from Salt Key Bank, and by the Nicholas or Old Bahama Channel from Cuba, from which Key San Domingo, the southern extremity of the Bank, is distant about 40 miles.

The greatest depth of the Gulf of Florida between Cape Florida and Gun Key, on the western side of the Great Bank, is 309 fathoms (1,854 feet), and more southerly, between Carysfort Reef and Orange Key (distance about 60 miles), 475 fathoms (2,850 feet). The greatest depth of the Santaren Channel, between the Great Bank and Anguilla Island on the Salt Key Bank (distance about 27 miles), is 386 fathoms (2,316 feet).

The Great Bank has an area of about 37,000 square miles, of which the islands upon it occupy about 2,357 square miles.

This Bank is penetrated at its centre by a deep Sound, the Gulf of Providence (known as the "Tongue of the Ocean"), for a distance of 110 miles, with an average width of 25 to 30 miles, approached from the northwest and northeast by the two Providence Channels.

The principal islands on the Great Bank are as follows:—

The Biminis, two small Keys on the western side, about 45 miles from Cape Florida. On the western edge of the Gulf of Providence, skirting the Bank, is Andros Island, the largest of the group (area 1,600 square miles), and to the northeast of it, the Berry Islands.

East of the Gulf of Providence and at the northeast and east edge of the Bank, is Eleuthera, followed in the same direction, southeast, and then south, by a succession of long, narrow islands, viz., San Salvador or Cat Island,* Long Island and Ragged Island.

On the north edge of the Bank, at the eastern entrance of the Gulf of Providence, is New Providence, and to the southeast of it, Exuma, with its chain of Keys extending 100 miles, lying on the eastern edge of the bank and on the western side of Exuma Sound, which breaks the continuity of the Bank between San Salvador and Long Island, and runs about 100 miles in a northwesterly direction, with an average width of 40 miles.

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* Watling's Island is, by some, called San Salvador, but in giving that name to Cat Island I follow Governor Rawson.

Salt Key Bank.—This Bank lies in the triangular interval west of the Great Bank, between it, Florida and Cuba. Its area is about 1,430 square miles; there are no inhabited Keys upon it.

Elbow Key, on its west side is about 50 miles distant from Sombrero Key (Florida Keys), and the greatest depth of water between them is 500 fathoms (3,000 feet). Salt Key, on the southwest of the Bank, is about 30 miles from Bahia de Cadiz (Keys north of Cuba), with depth between them of 534 fathoms (3,204 feet). The distance and depth of the Santaren Channel, between Anguilla Island (Salt Key Bank) and the Great Bank, have been already stated.

Islands east of, and between, the Great Bank and the Caicos Bank.—To the eastward of the Great Bank, and separated from it and from each other by deep water, are Watling's Island (40 miles east of the south end of San Salvador), Rum Key (24 miles from the northeast end of Long Island) and Conception Island, which is between San Salvador and Rum Key.

Southeast of Long Island the chain of islands is continued to the southeast and south, as follows:—On a distinct Bank, separated from Long Island on the Great Bank by the Crooked Island Passage (25 miles in width), are Crooked Island, Acklin's Island, with Castle Island, of small size, at its southern extremity, and Fortune Island or Long Key.

To the northeast of Crooked Island lies Samana or Atwood Key (uninhabited), and to the east of Acklin's Island there is a cluster of small islets, called Plana, or French Keys. To the southeast, about 45 miles from Acklin's Island, is Mayaguana.

Caicos and Turk Islands Banks.—In the same southeasterly direction is the Caicos Bank (on which are several islands), separated from Mayaguana by the Caicos Channel, about 30 miles in width, and at a short distance to the southeast, on another Bank, with the Turk Passage between it and the Caicos Bank, lie the Turk Islands.

Mouchoir Carré, Silver and Navidad Banks.—These three Banks of coral and sand, separated by deep water channels of 30 to 40 miles in width, extend the Bahama chain of islands to the southeast, about 100 miles, viz., Mouchoir Carré, Silver Bank, which is about 36 miles north of Cape Viejo Francés (San Domingo) and Navidad Bank, the southeast end of which lies north-northeast about 32 miles from Cape Cabron, the nearest part of San Domingo.

Great and Little Inagua, or Heneagua.—Detached from all the other islands, from 60 to 70 miles south of Acklin's Island and Mayaguana, nearly in the latitude of the Turk Islands, are Great and Little Inagua, standing, I believe, on one Bank. Great Inagua (area 530 square miles) is one of the largest and finest of the Bahama group. These islands, north of, and opposite the Windward Passage, between Cuba and San Domingo, are about 65 miles from the northwestern extremity of the latter and about 50 miles from Point Maysi the northwestern end of the former.

Lieut. Nelson (Proc. Geo. Soc., IX, 203) mentions that, generally speaking, the islands are on the windward sides of their respective groups and banks. The exceptions referred to by Mr. Rawson (Report, 11) are Grand Bahama on the southern side of the Little Bank, New Providence on the northern side, and the Biminis on the northwestern edge of the Great Bank.

No part of any of the islands exceeds the height of 200 feet, generally much less. The shores of a few present an abrupt face, or cliff, not exceeding 40 feet in height. They are almost universally environed with reefs or shelves of rock, which extend often to a considerable distance, and usually terminate abruptly. Professor Agassiz (Bulletin Mus. Comp. Zool., I, 271) observes that "the Bahamas and the reefs to the northeast of Cuba exhibit very abrupt slopes and a great depth is reached close to the shores of the Banks, so that the Bahamas resemble the coral reefs of the Pacific much more than the reefs of the coast of Florida."

Dana refers to the Bahamas as being coral reefs and reef islands, essentially like atoll reefs.

The geological formation of these islands appears to be very similar to that of Bermuda; their form and surface condition, being due to a great extent to the prevailing winds and currents, but owing much, probably, as remarked by Dana, with reference to the Bermudas, "to the configuration of the land upon which the coral reefs were built up."

Nelson (*l.c.*) explaining his reasons for calling the Bahamas the *Gulf Stream Delta*, refers to it as,—

> "A *Delta* which has been apparently thrown down by the waters of the Gulf Stream on their receiving a check from those of the Atlantic as they emerge in full strength from the Gulf of Mexico." He adds, "although such deposits will be greatly accelerated in formation, and gain much stability, by finding ready-made hilly ground under the sea, nevertheless they can be formed without this; but taking into account the remarkably symmetrical relation between the sweep of the Bahamas and that of the submarine mountain range of the Leeward Islands (with which they form a continuous S-like series), as well as the very general absence of shifting

> sands, it may be surmised that the Bahama Delta *has had* the advantage of such ready-made base and submarine nucleus of aggregation."

With respect to the present surface condition of the Bahamas, as compared with that of the Bermudas, the evidence lately made known by Mr. J. Matthew Jones of subsidence in the latter should not pass unnoticed.

In a communication published in "Nature" (Aug. 1, 1872), Mr. Jones explains that about two years ago submarine blastings were carried on at the entrance of Hamilton harbor, and at a depth of over six fathoms a cavern was broken into which contained stalactites and red earth. Also, that during the past two years similar blastings had taken place inside an artificial harbor, situate at the western extremity of the islands, for the purpose of forming a bed of sufficient depth for the reception of the great dock constructed several years ago, in England.

Mr. Jones thus states and comments on the results:—

> "The excavations extended to a depth of 52 feet below low water mark. At 46 feet occurred a layer of red earth 2 feet in thickness, containing remains of cedar trees, which layer rested upon a bed of compact calcareous sandstone. Here we have the first satisfactory evidence of the submergence of an extensive deposit of soil once upon the surface, and that to the depth of 48 feet below the present low water level, which consequently grants an equal elevation above it in former times. Now on carefully surveying the Bermuda chart, we find that an elevation of 48 feet will bring the whole space which intervenes between the present land and the barrier reef, now covered with water, above the water level. This attained, what more is required to prove the former extent of the island group, before the present submergence, to the present barrier reef?

Mr. Jones promises further evidence on this interesting subject.

Whether any similar proofs of subsidence have been noticed in the Bahamas, I am unable to state.

I now propose to consider the evidence afforded by the distribution of the Land Shells on the Bahama Islands.

The total number of species known to inhabit the Bahamas is about 80, of which a few species have not yet been satisfactorily determined or described;* 20 belong to operculate genera, and the remainder are inoperculates.

The operculate genera represented are *Ctenopoma*, *Cyclostomus*, *Cistula*,† CHONDROPOMA, *Trochatella*, HELICINA *Schasicheila* and *Alcadia*.

The occurrence on the Great Bank, in New Providence and Eleuthera, of a *Schasicheila* (*S. Bahamensis* Pf.), is singular, inasmuch as the genus is not otherwise represented in the West Indies. Of the four other known species, three belong to the Mexican fauna; the habitat of *S. minuscula* Pf. is unknown.

The operculates considered, the land shell fauna of the Bahamas is essentially West Indian, and that of the Great Bank closely allied to the Cuban fauna.

Of the five species (exclusive of *Cistula scabrosa*) on the Great Bank, all of which are confined to it, the three following are also found in Cuba; *Chondropoma canescens* Pfr., *Trochatella rupestris* Pfr., and *Alcadia minima* Orb.

There are no Cuban operculate species east of the Great Bank. Several species of the Crooked Island Bank occur in Inagua, and one on the Turk Bank, while three species are common to the latter and Inagua.

With respect to the inoperculate species, omitting several, the affinities of which have not been determined, the following genera and groups are represented, viz.: *Zonites* (*Conulus?*); *Helix* (*Microphysa*, *Polygyra*, *Thelidomus*, PLAGIOPTYCHA and POLYMITA); *Cylindrella* s. s., one species; *Macroceramus*, two species; *Bulimulus* (*Liostracus*, *Mesembrinus* and *Leptomerus*, one species of each); *Cionella* (*Leptinaria*, one species); *Stenogyra* (*Opeas*, *Subulina*, *Melan-*

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* A complete catalogue of the species, showing their distribution, is in course of preparation and will shortly be published.

† The single species *C. scabrosa* Humph., referred by Sowerby to Providence Island, and by Gray to Jamaica, I do not know. The names of genera or groups (of the inoperculates also), most numerously represented, are printed in capital letters.

iella); *Pupa* (STROPHIA and *Leucochila*); *Orthalicus; Succinea; Glandina* (*Oleacina*, one species).

Judging from the inoperculates, as well as the operculates, the West Indian character of the Bahama land shell fauna is manifest.

The following is a list of the inoperculate species common to the Bahamas and the adjacent continent, Bermuda and certain of the West India Islands. The distribution in the Bahamas is indicated by the use of the abbreviations L. and Gt. Bk. (Little and Great Bank); Is. East (islands between the Great and Caicos Banks); Turk Is.; Gt. and L. Inagua (Great and Little Inagua).

ZONITES.

Conulus? Gundlachi Pfr.,	Gt. Bk.,	Florida, Cuba. Haiti, Porto Rico.

HELIX.

Microphysa vortex Pfr.,	Gt. Bk.,	Florida, Cuba, Haiti, Porto Rico.
Microphysa Boothiana Pfr.,	Gt. Bk.,	Cuba, Haiti.
Polygyra microdonta Desh.,	Gt. Bk.,	Bermuda.
Thelidomus provisoria Pfr.,	Gt. Bk.,	Cuba.
Plagioptycha Albersiana Pfr.,	Gt. Inagua, Turk Is.,	Haiti.
Plagioptycha disculus, Desh.,	Turk Is.,	Haiti.
Polymita varians Mke.,	L. and Gt. Bk., Is. East.,	Florida Keys.
MACROCERAMUS *Gossei* Pfr.,	Gt. Bk.,	Florida, Cuba.

BULIMULUS.

Leptomerus sepulcralis Poey,	Gt. Bk.,	Cuba.

STENOGYRA.

Opeas subula Pfr.,	Gt. Bk.,	Florida, Cuba, Haiti, Porto Rico.
Opeas octonoides C. B. Ad.,	Gt. Bk.,	Florida, Cuba, Porto Rico.
Subulina octona Ch.,	Gt. Bk.,	Florida, Cuba, Haiti, etc.
Melaniella gracillima Pfr.,	Gt. Bk.,	Florida, Cuba, St. Thomas.

PUPA.

Strophia mumia Brug.,	L. Bk., Turk Is.	Cuba.
Strophia iostoma Pfr.,	Turk Is., Gt. Inagua,	Cuba.
Strophia incana Binn.,	Is. East,	Florida Keys. Cuba.
Strophia marmorata Pfr.,	Gt. Bk.,	Cuba.
Strophia cyclostoma Küst.,	Gt. Bk.,	Cuba.
Strophia Cumingiana Pfr.,	Is. East,	Cuba.
*Leucochila fallax** Say,	Is. East, Turk Is., Gt. Inagua,	Bermuda, Florida, Cuba, Haiti.
Leucochila pellucida Pfr.,	Turk Is., Gt. Bk.,	Bermuda, Texas? Cuba, Haiti.
ORTHALICUS *undatus*† Brug.,	Gt. Bk.,	Florida, Cuba.
SUCCINEA *luteola* Gould,	Gt. Bk.,	Texas, Florida, Haiti.

GLANDINA.

Oleacina solidula Pfr.,	Gt. Bk.,	Cuba.

The distribution shown in the foregoing list proves in a marked manner the alliance of the Bahamas, and of the Great Bank especially, with Cuba. The numerous representatives of *Polymita* and of *Strophia*, and the occurrence of *Polygyra*, *Thelidomus* and *Melaniella* on the Great Bank only (all three groups unrepresented in Haiti) afford similar proof, while the development of *Plagioptycha* in the Turk Islands and Great Inagua, with the fact that *P. Albersiana* and *disculus* are common to them and Haiti, appears to indicate their connection with the latter island.

Dr. Cleve (Geology of the N. E. West India Islands, Stockholm, 1871) mentions that Anegada (on the Virgin Bank) is geologically in all respects different from the other Virgin Islands, that it lies northwest to southeast (the others extending from west to east) and has a close resemblance to the Bahamas. The land shells of Anegada, however, in common with those of the other islands on the

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* I include, for the present purpose, the forms known as *marginatus* and *nitidulus*.

† A single specimen in the cabinet of Mr. Rawson, said to be from the Biminis.

Virgin Bank, have no special relations with those of the Bahamas. Most of the Anegada species occur in other of the Virgin Islands and in Porto Rico, none of them in the Bahamas.

In connection with the facts stated as to the distribution of terrestrial shells in the Bahama Islands, and the inferences with regard to their former more intimate relations with each other and with adjacent lands, the views of Prof. Dana (Corals and Coral Islands, 1872) are of great value. In the chapter vi (p. 348), entitled "Geological Conclusions," Dana considers at some length "The Oceanic Coral Island Subsidence," and after treating the subject with reference more especially to the Pacific tropics, he says (p. 368) :—

"The changes which took place cotemporaneously in the Atlantic tropics are very imperfectly recorded. The Bahamas show by their form and position that they cover a submerged land of large area, stretching over six hundred miles from northwest to southeast. The long line of reefs and the Florida Keys, trending far away from the land of southern Florida, are evidence that this Florida region participated in the downward movement though to a less extent than the Bahamas. Again, the islands of the West Indies diminish in size to the eastward, being quite small in the long line that look out upon the blank ocean, just as if the subsidence increased in that direction. Finally, the Atlantic beyond is water only, as if it had been made a blank by the sinking of its lands.

"Thus the size of the islands as well as the existence of coral banks, and also the blankness of the ocean's surface, all appear to bear evidence to a great subsidence.

"The peninsula of Florida, Cuba and the Bahamas look, as they lie together, as if all were once part of a greater Florida, or southeastern prolongation of the continent. The northwestern and southwestern trends, characterizing the great features of the American continent, run through the whole like a warp and woof structure binding them together in one system; the former trend, the northwest, existing in Florida and the Bahamas, and the main line of Cuba; and the latter course, the west-southwest, in cross lines of islands in the Bahamas (one at the north extremity, another in the line of Nassau, and others to the southeast), on the high lands of northwestern and southeastern Cuba, and in the Florida line of reefs, and even further, in a submerged ridge between Florida and Cuba. This combination of the two continental trends shows that the lands are one in system, if they were never one in continuous dry land.

"We can not here infer that there was a *regular* increase of subsidence from Florida eastward; or that Florida and Cuba participated in it equally with the intermediate and adjoining seas; for the facts in the Pacific have shown that the subsiding oceanic area had its nearly parallel bands of greater and less subsidence; that areas of greatest sinking alternated with others of less, as explained on page 326; and that the groups of high islands are along the bands of least sinking. So in the Atlantic, the subsidence was probably much greater between Florida and Cuba than in the peninsula of Florida itself; and greater along the Caribbean Sea parallel with Cuba, as well as along the Bahama reefs, than in Cuba.

"The position of the lonely Bermuda atoll confirms these deductions. Its solitary state is reason for suspecting that great changes have taken place about it; for it is not natural for islands to be alone. The tongue of warm water, due to the Gulf Stream, in which the Bermudas lie, is narrow, and an island a hundred miles or more distant to the northeast-by-east, or in the line of its trend (p. 219), if experiencing the same subsidence that made the Bermuda land an atoll, would have disappeared without a coral monument to bear record to its former existence. Twenty miles to the southwest-by-west from the Bermudas, there are two submerged banks, twenty to forty-seven fathoms under water, showing that the Bermudas are not completely alone, and demonstrating that they cover a summit in a range of heights; and it may have been a long range."

The facts regarding the diminution in size of the islands of the West Indies to the eastward, are of peculiar interest, not only as affording conclusive evidence of the greater subsidence in that direction, but in connection with geographical distribution.

The banks and islands forming the long Bahama chain diminish in size to the southeast, where are situated at its termination the submerged Mouchoir Carré, Silver and Navidad Banks. In a similar manner the submerged Virgin Island Bank (with Anegada on its northeastern extremity, geologically, in the opinion of Dr. Cleve, resembling the Bahamas), Sombrero and the Anguilla Bank, terminate the chain of the West Indies (parallel with the Bahamas) eastward from Cuba.

In the caves of Anguilla the remains of large extinct mammalia are found, which must have inhabited a far more extensive area, subsequently broken up by subsidence.

Packard (Amer. Nat., 1872) remarks, "there is every probability that the separation of these islands (of the eastern part of the West Indies) took place at a late period of time, and probably subsequent to the spread of the post-pliocene fauna over North America."*

Dr. Cleve (*l. c.*) observes that "the Bahama Islands, the Island of Anegada, and a part of Barbuda belong to a very recent period."†

The same author (*l. c.* 18), referring to the "Leeward Islands," states as follows:—

> "The Islands north of Guadaloupe form two parallel chains from northwest to southeast. The western chain commences with *Saba* and consists of *St. Eustatius*, *St. Kitts*, *Nevis*, *Redonda* and *Montserrat*. All of those islands are volcanos and if the line were extended farther to the North it would reach the island of Anegada, of post-pliocene date, and all the volcanos seem to be of the same or nearly the same geological time. The Bahama Islands, which are also most probably of post-pliocene date, have the same direction and seem to be the continuation of the same or of a parallel line of elevation. East of the volcanic range is another completely different range of islands. They are not volcanic and commence with *Sombrero* comprising *Anguilla*, *St. Martin*, *St. Bartholomew*, *Barbuda* and *Antigua*. All of these islands are of the tertiary age, *eocene*, *miocene* and *pliocene*."

In his "Summary of the Geology of the West Indies" (*l.c.* 47), Dr. Cleve says:—

> "From the facts exposed above it may consequently be inferred, that of the two prevailing lines of elevation in the West Indies, the one running from west to east originated before the miocene time, and that the other from northwest to southeast, commencing with the Bahamas and continuing in the same direction down to Trinidad, was formed after the miocene time."

While considering the facts, and geological grouping of the Islands quoted above from Dr. Cleve's paper, it should be remembered that the land shell fauna of Saba, of St. Eustatius, St. Kitts and Nevis (all three on one Bank) and of Redonda and Montserrat, and of Barbuda and Antigua (the last two on the same Bank) is, in common with most of the islands to the south, to and inclusive of Trinidad, distinct from the fauna of the islands between and inclusive of the Bahamas and Cuba, and the Anguilla Bank, on which are Anguilla, St. Martin and St. Bartholomew.*

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*See also Cope, Proc. Acad. Nat. Sci. Phil., 1868, and Bland, Proc. Amer. Phil. Soc.' 1871.

†*Helicina convexa* is common to Bermuda and Barbuda.

This difference of the faunas, and the well defined line of their separation, must be considered in connection with the past and present geological history of the Islands.

The distribution of the species of the genera *Macroceramus* and *Strophia* illustrates in a marked manner the distinctness of the two faunas just mentioned. *Macroceramus* has two species in the Bahamas (1 common to the Great Bank, Florida and Cuba, *M. Gossei*, being the only species found in Jamaica); 36 in Cuba, and 10 in Haiti of which 1 (*M. Gundlachi*) occurs in both.

There are two other species only in the islands between and inclusive of Porto Rico and those on the Anguilla Bank, *M. signatus* which besides Haiti, is found in Tortola, Necker Island and Anegada, all on the Virgin Bank, and in Anguilla and St. Bartholomew on the Anguilla Bank; *M. microdon* occurs in Porto Rico, Vieque, St. Thomas, Tortola and Anegada. The genus is not represented in St. Croix, and not in any of the islands south of the Anguilla Bank.

Strophia has 16–18 species in the Bahamas of which 1 is also in the Florida Keys, and at least 6 in Cuba; 17 in Cuba; none in Jamaica; 2 in Haiti, of which one, *S. striatella*, occurs in Cuba, Porto Rico, Necker Island and Anegada, and the other, *S. microstoma*, is found also in Cuba, Haiti and Porto Rico (*fide* Pfr.). Remains of a fossil species, undeterminable, are noticed in Sombrero, and a fossil species in St. Croix. There is no representative of the genus on the Anguilla Bank or to the south of it.

The exceptions are curious, *Macroceramus Gossei* and *Strophia uva* are found in Curaçao!†

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* See Bland, Proc. Amer. Phil. Soc., *l. c.*

† I desire to acknowledge my obligations for specimens and the means generally

Dana as already quoted, refers to parallel bands of greater and less subsidence in the Pacific Ocean, and to analogous conditions in the Atlantic; — the subsidence was probably, he says, "much greater between Florida and Cuba than in the Peninsula of Florida itself; and greater along the Caribbean sea parallel with Cuba, as well as along the Bahama reefs, than in Cuba." Recent soundings show in these respects the following facts:

The greatest depth in the Gulf of Florida, between Key West and Havana is within 5 miles of the latter, 800 fathoms (4,800 feet), and I have already stated that there is a depth in the Nicholas Channel, between Salt Key Bank and Cuba of 534 fathoms (3,204 feet).

Between Cuba and the east end of Jamaica the depth is 1,244 fathoms (7,464 feet). Eastward of Jamaica, along the southern side of Haiti, in about the latitude of Beata Island, great depths have been ascertained, — one sounding west of that Island gave 2,136 fathoms (12,816 feet), and one to the eastward of it 1,840 fathoms (11,040 feet). The greater subsidence still further to the east, between the Virgin Bank and St. Croix, may be inferred from the enormous depth there found of no less than 2,580 fathoms (15,480 feet).

A line of soundings from the south side of Jamaica and east of the Pedro Bank, across the Caribbean Sea to Aspinwall (a distance of about 550 miles), shows the instructive fact that, with no very considerable exception, the sea bottom slopes gradually from Jamaica towards the coast of the Isthmus of Panama. About 60 miles from Manzanilla Point (N.E. of Aspinwall), the depth is 1,215 fathoms (7,290 feet). The bottom then rises comparatively rapidly, — the depth at about 40 miles from Aspinwall being 677 fathoms (4,062 feet), and at about 20 miles, 227 fathoms (1,362 feet).

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of studying the land shells of the Bahamas, to the late Mr. Wm. Cooper, Dr. Bryant, and Mr. Robert Swift: also to Mr. W. W. Miller, Mr. Daniel Sargent, of Inagua, and Dr. Weinland, but especially to Mr. Rawson W. Rawson formerly Governor of the Bahamas, and now of Barbadoes and the Windward Islands.

In connection with the relations of the land shell faunas of the islands on the north side of the Caribbean Sea, I may mention that the greatest depth between the coast of Yucatan and Cape San Antonio, the western extremity of Cuba, about midway between the two, is 1,164 fathoms (6,984 feet),*—between the east end of Jamaica and the west end of Haiti (so far as is yet known), 600 fathoms (3,600 feet), and north of Mona Island, in the Mona Passage (between Haiti and Porto Rico) 250 fathoms (1500 feet). I postpone comparison of the faunas of the islands and the adjacent parts of the North American continent, but in regard to the depth between Haiti and Jamaica on the west side, and Porto Rico on the east it is noticeable, that while the fauna of Haiti has very little relation with that of Jamaica, it has much alliance with that of Porto Rico.

XXIX.—*Spectroscopic Examination of Silicates.*

BY PROF. ALBERT R. LEEDS,
Stevens Institute of Technology, Hoboken, N. J.

Read March 10, 1873.

WHILE conducting the analysis of a silicious mineral, and determining its alkalies by the well-known and universally employed process of Prof. J. LAWRENCE SMITH, which it would be entirely superfluous to repeat here, it occurred to me that a modification of this process would be valuable in the spectroscopic examination of silicates.

It is evident that a pulverulent mixture of a powdered mineral with sal-ammoniac and precipitated calcic carbonate could not be employed in spectroscopic work, while an easily fusible chloride would be well adapted to it. The plan was therefore adopted of mixing a small quantity of the finely powdered mineral with an alcoholic paste of chemically pure calcic chloride, and exposing a pellet of the pasty mass, on a platinum loop, to the outer flame of a Bunsen burner, before the slit of the spectroscope.

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*I am indebted to the kindness of Professor Peirce, Superintendent of the U. S. Coast Survey, and of Professor Henry, of the Smithsonian Institution, for full particulars of the deep-sea soundings between Cape Catoche and Cape San Antonio, ascertained on the survey in 1872.

This, it will be seen at once, is a return to the plan proposed many years ago, by Prof. Henry Wurtz, for effecting the decomposition of silicates and the extraction of their alkalies. For some reasons unknown, this method, which would seem to be an excellent one, does not appear to have come into general use. It will be found, however, that in its novel application to spectroscopic work, it effects the desired object with such ease and rapidity, and with so small an expenditure of reagent and material, that hereafter the mineralogist will wish to add this reagent to those in most constant use. The calcic chloride paste is most conveniently preserved in a small wide-mouthed bottle, stoppered carefully to prevent the evaporation of the alcohol. There is the disadvantage in its practical working, that the calcium spectrum is always present: and the difficulty of preparing and using such a reagent in a way that will exclude the presence of minute quantities of sodium, is so great, that the presence or absence of the sodium band cannot be regarded as demonstrating the presence or absence of sodium in the mineral under examination. On the other hand, an extremely small quantity of the mineral is required. In most cases it is sufficient to select a part of the mineral which appears to be perfectly pure and unaltered, and to rub off as much of the powder (with the corner of a file) as could be taken on the end of a small knife-blade. This is then rubbed up, successively, with either an equal amount of the paste, or twice, thrice, or four times that amount, as may be found necessary. Generally an equal amount will be sufficient. An attempt was made to substitute magnesic for calcic chloride, in order to get rid of the calcium spectrum; but this reagent was not powerful enough to effect decomposition. The results which may be obtained with baric and strontic chlorides, etc., are still to be looked for. It should be remarked that no acid vapors are set free by this process, and that the spectroscopist may work for hours in a dark room, without injury to himself or his apparatus; which he could not do if the mineral were moistened with hydrochloric or other acid.

To speak of the results thus far obtained, I would say that many minerals which have been reputed to contain alkalies, have revealed this fact when tested by the calcic chloride process, and that many others in which the alkalies have previously escaped detection, have manifested them in the most striking manner. It is very noticeable, when rocks and minerals are treated in the manner described, that lithium, in minute quantities, is not a rare but a very common element. Thus, for example, a light greenish muscovite from Dixon's Quarry, near Wilmington, Del., contains lithium as well as potassium and sodium. In the list of analyses of muscovites which is cited in Dana's Mineralogy (5th ed., p. 310 and 311), it will be seen that only two muscovites are reported as lithium-holding. One is a rose colored mica from Goshen, Mass., which was analyzed by Prof. Mallet, and contains 0·64 per cent. of lithium. The other is a mica from Orange Co., N. Y. (the analysis cited differs very widely from that of a normal muscovite), and contains 0·06 per cent. lithium.

One of the varieties of fibrolite, known as bucholzite, which occurs as a silky-white coating upon the gneiss rocks bordering the Schuylkill river in the vicinity of Philadelphia; gives with calcic chloride, both potassium and lithium bands. None of the fibrolites, nor any of its varieties, sillimanite, monrolite, xenolite, wörthite, have ever been reported to contain alkaline metals, except a specimen of bucholzite, analyzed by Brandes (Jour. de Pharm., XCI, 237), and quoted in Dana's Mineralogy, 5th ed., p. 374. It contained 1·5 per cent. of potassa.

Certain minerals in which we should confidently expect to find no alkalies were examined, and as a confirmation of analysis the negative results have a certain value. Among these were a number of wollastonites; chrysotile and baltimorite from the chrome mines of Lancaster Co., Pa.; the variety of ripidolite, known as clinochlore, from the serpentine quarries of Chester Co., Pa., and the crystallized ripidolites of Texas, Lancaster Co. The crystallized kaemmererites, a variety of penninite, from Texas, likewise gave no alkaline spectra.

The examination of a number of vermiculites was of particular interest, as showing the presence of lithium in all of them, whereas hitherto it had been detected in none. Some of these vermiculitic minerals are varieties of ripidolite more or less altered, others have been made into separate species under the names of vermiculite and jefferisite. But all of these minerals are probably the results of alteration, and it is a curious fact that all of them contain lithium. This may, at a later time, perhaps, assist to explain the causes and manner of those surprising alterations visible along the line of the serpentine ridges of Pennsylvania, New Jersey, and probably elsewhere. Of the vermiculites from the original locality at Milbury, Mass., I had no specimen to examine, but an exfoliating mineral in bronze colored scales from the chlorite schist bordering the serpentine quarries above Manayunk on the Schuylkill river, contained lithium; the matrix of chlorite schist contained none. Three other varieties of exfoliating ripidolite from Chester Co., Pa., gave similar results. A leek-green variety gave a very strong and persistent lithium band; a bronze colored, a band less positive; and a light green variety, a faint lithium band. A quantitative analysis of the first gave 0·33 per cent. of lithium; of the second a trace, and of the third, none. Another vermiculite, occurring at Texas, Pa., in a seam between talc upon one side and oligoclase-felsite on the other, gave a decided lithium band. The mineral occurs in brownish scales, orthorhombic in form, and optically biaxial. A quantitative determination afforded 0·41 per cent. of lithia and soda. The pure alkaline chlorides obtained in the course of the analysis, and which together weighed 0·009 grm., were carefully tested and found to contain no *potassium* whatever, but to consist entirely of lithium and sodium. The calcic chloride process is thus valuable in showing the isomorphic replacement of one element by another. For in a mineral very similar to the one above described, except that it crystallizes in broad plates instead of small scales, and which has been called jefferisite by Prof. Brush, lithium appears in many instances to take the place of potassium. The analysis of jefferisite by Prof. Brush (Dana's Min., p. 494), gives soda trace, potassa 0·43 per cent. A large number of jefferisites, from the serpentine quarry three miles southwest of Westchester, Pa., afforded only the lithium band with calcic chloride paste.

In the above instance, I neglected to separate the alkalies. But in the case of a mineral resembling ripidolite, and occuring in connection with the corundum at Unionville, Pa., I have made the determination and found that, in certain cases, this method is of surprising delicacy. This bluish-green variety of ripidolite gave the lithium band very distinctly. It contains only 0·11 per cent. of lithia and 0·14 per cent. of soda. The pure chlorides obtained in the course of the examination were tested, and found to contain not the slightest trace of potassium. As only 0·005 grm. of the ripidolite was employed, the spectroscopic examination which required two minutes to perform, revealed the presence of the one two hundred thousandth part of a gramme of lithia.

It would be unsafe to infer from this statement that the calcic chloride process is equally delicate in the case of every mineral, and of every element capable of manifesting itself in the spectroscope; for certain minerals seem to resist decomposition in this manner with great obstinacy; and, moreover, of the elements, lithium appears to rival sodium in the volatility of its chloride and the persistency of its spectrum band. For instance the variety of muscovite, termed margarodite, from Trumbull, Conn., affords a spectrum with a faint potassium and a strong lithium band. This cannot be ascribed to the presence of those alkalies in the relative quantities indicated by their spectra, because the analyses of margarodite (Dana's Min., p. 310) exhibit in some instances as much as 12 per cent. of potassa. In fact the muscovites, as a class, do not yield up their alkalies under the decomposing action of calcic chloride as readily as many other minerals do. For example, we may take the well known specimens from Pennsbury, Chester Co., Pa. When mixed with an equal amount of the paste, this mineral in powder gave the potassium band faintly, after exposure to the flame for over a minute; with four times the amount of calcic chloride, it gave the spectrum more strongly than at first; but when mixed with eight times as much, the spectrum was no stronger than at the beginning. In the case of a muscovite (from an uncertain locality) no potassium band whatever made its appearance. A still more striking illustration of what is said above, is afforded by the pink scapolites of Bolton, Mass. A compact, beautifully pink, and apparently quite unaltered specimen of this mineral, gave a lithium band, but no potassium.

We are fortunate in possessing two analyses of this pink scapolite (Dana's Min., pp. 320 and 806). According to one, it contains 4·52 per cent. of soda and 0·54 per cent. of potassa; to a second, 6·55 per cent. of soda, with a little potassa. That no doubt might remain, I have analyzed a greenish-white compact translucent wernerite with a spec. grav. of 2.71, from Attleboro', Bucks Co., Pa., and find that it contains $Si\ O_2$ 47·47; $Al_2\ O_3$ 27·51; $Fe_2\ O_3$ trace; $Mg\ O$ 1·20; $Ca\ O$ 17·59; $Na_2\ O$ 3·05; $K_2\ O$ 1·40;

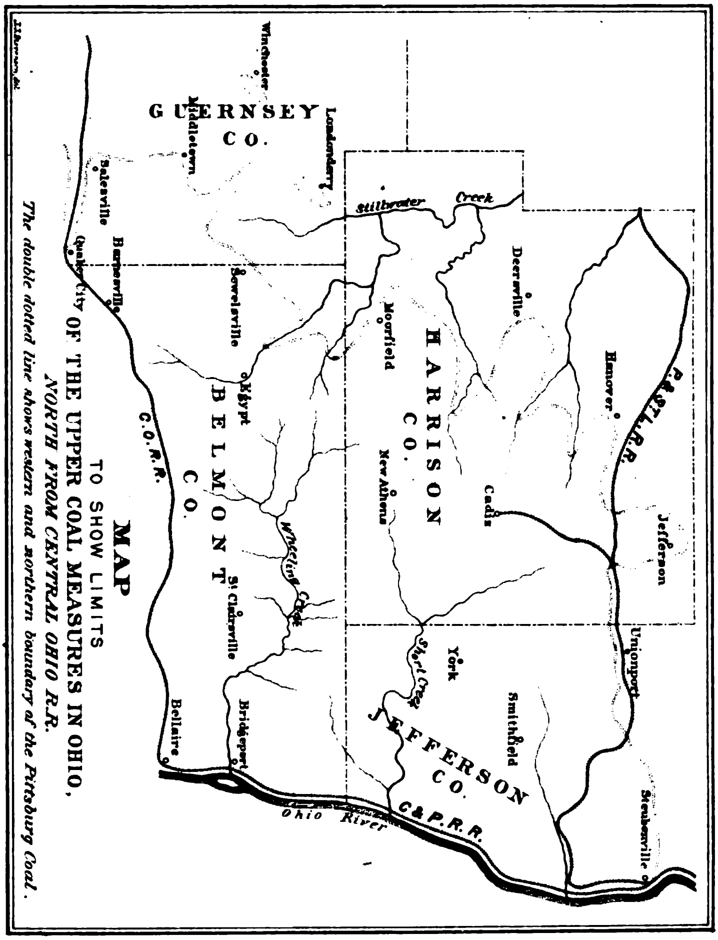
H_2O 1·48 = 99·70. But this mineral, containing over 1 per cent. of potassa, gave no potassium band. The orthoclases and oligoclases which I have thus far examined undergo decomposition by this process and reveal potassium.

The hexagonal biotite from Lake Laach gives a faint potassium line, while an analysis (Dana's Min., p. 305) shows that it contains 8·60 per cent. of potassa. The examination of various altered pyroxenes indicated no potassa, so that if thermal waters containing potassa in solution were in some instances the agents of decomposition, they have left no traces which this process can detect.

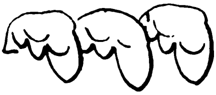
In conclusion, it may perhaps be fairly said, that while the calcic chloride process, for a spectroscopic examination, is a most convenient and valuable one for detecting the presence of substances, other than calcium and sodium, which afford spectra, yet it does not equally well prove their absence, since they may be present in bodies which resist decomposition in this manner.

In this case, however, a preliminary spectroscopic examination would be of value, as affording an indication of the amount of reliance to be placed upon a quantitative determination of the alkalies, by calcic chloride alone.

Finally, my thanks are due to Mr. F. E. Hilgard, of the first class of the Institute, for his painstaking examination of a large number of minerals by this process.



MAP
TO SHOW LIMITS
OF THE UPPER COAL MEASURES IN OHIO,
NORTH FROM CENTRAL OHIO R.R.
The double dotted line shows western and northern boundary of the Pittsburg Coal.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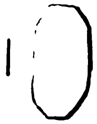
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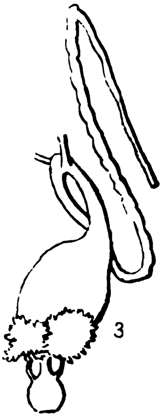
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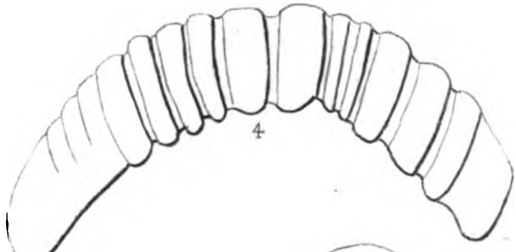
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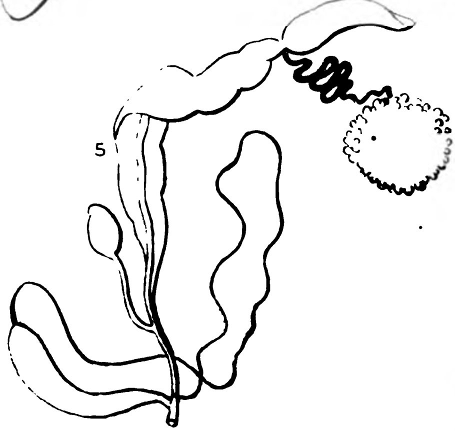
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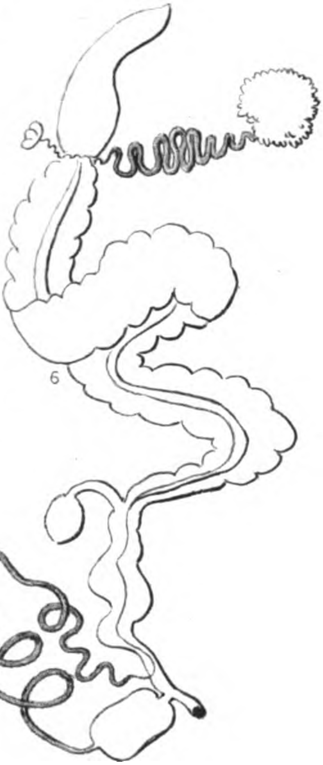
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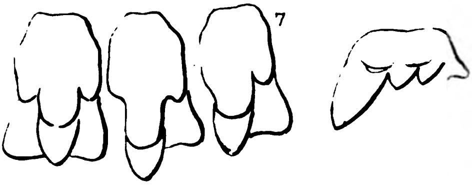
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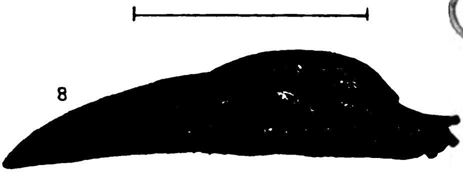
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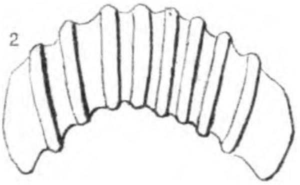
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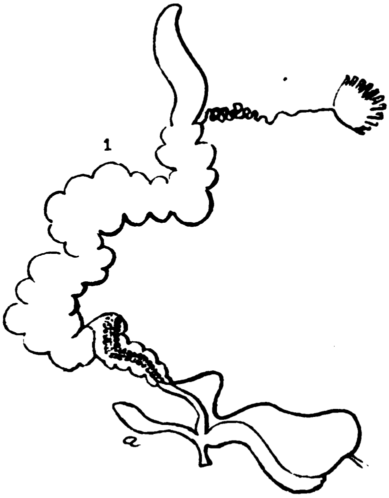
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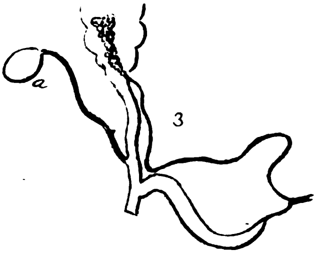
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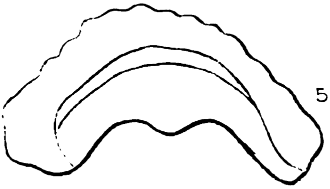
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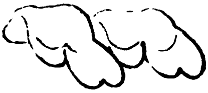
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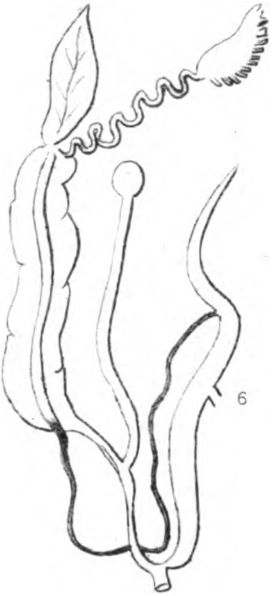
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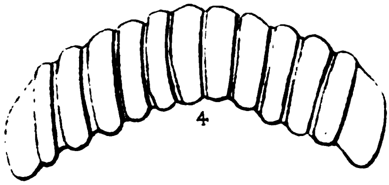
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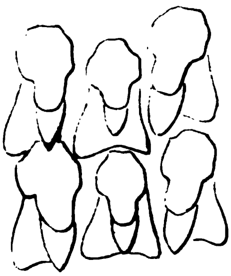
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J.H.Bufford's Lith.

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Believing that a general knowledge of the contents of the volumes published by the LYCEUM OF NATURAL HISTORY will be advantageous to scientists and bring about a wider circulation of the publications, the following summary has been prepared.

The Annals of the Lyceum of Natural History of New York

are in 8vo form and contain many plates and woodcuts. The first eight volumes cover the years 1823 to 1867 as follows:

Volume I. — With 29 Plates and 410 pages, 1823-1825.
II. — With 6 Plates and 480 pages, 1826-1827.
III. — With 6 Plates and 448 pages, 1828-1836.
IV. — With 18 Plates and 519 pages, 1836-1848.
V. — With 6 Plates and 567 pages, 1848-1852.
VI. — With 9 Plates and 443 pages, 1853-1858.
VII. — With 6 Plates and 514 pages, 1858-1862.
VIII. — With 17 Plates and 505 pages, 1863-1867.

These eight volumes contain many valuable papers, including the descriptions of hundreds of new species of animals, plants, etc. The papers may be grouped as follows: —

ON GEOLOGY, by Smith (S.), Stevens, Julien. ON PALÆONTOLOGY, by Cooper (W.), Cozzens, DeKay, Hitchcock (C. H.), Mitchell, Renwick, Redfield. ON MINERALOGY, by Dana, Delafield, James, Bailey (S. C. H.), Joy, Renwick, Torrey, Totten, Thomson. ON BOTANY, by Torrey, Cooper (Wm.), Gray, Darlington, Harley, Dana, LeConte, Madianna, DeSchweinitz, Croom. ON MAMMALIA, by Cooper (Wm.), Cozzens, DeKay, King, Ludlow, LeConte. ON BIRDS, by Audubon, Bonaparte, DeWitt Clinton, Jones, Gundlach, Ward, Baird, Bell, Giraud, Lawrence. ON REPTILES, by LeConte, Smith, Troost. ON FISHES, by DeWitt Clinton, Mitchell, DeKay, Poey, Brevoort, Suckley, Tellkampf, Gill. ON INSECTS, by LeConte (J.), LeConte (J. C.), Greene, Grote, Robinson, Hill, Matthews. ON CRUSTACEANS, by LeConte, Gill, Stimpson. ON ANNELIDES, by Agassiz. ON MOLLUSKS, by Barnes, DeKay, Jay, Redfield, Fairbank, Gill, Gulick, Haines, Newcomb, Cooper (J. G.), Shuttleworth, Adams, Chitty, Prime, Anthony, Bland, Rowell, Smith (S.), Hubbard, Krebs, Morse. ON RADIATES, by Agassiz, Edwards. ON MICROSCOPY, by Edwards. ON METEOROLOGY, by Morris.

The following is a list of the contents in full of Volume IX, with 2 plates and 426 pages, 1868 to 1870.

By ALEXANDER AGASSIZ. Note on Lovén's Article on "Leskia mirabilis, Gray."

By W. G. BINNEY and THOMAS BLAND. Notes on Lingual Dentition of Mollusca.

By THOMAS BLAND. Notes on certain Terrestrial Mollusca, with Descriptions of New Species; Additional Notes on the Geographical Distribution of Land Shells in the West Indies.

By H. C. BOLTON. Index to the Literature of Uranium.

By A. D. BROWN. Note on Bulimus ciliatus, Gould.

By W. H. DALL. On the Genus Pompholyx and its Allies, with a revision of the Limnæidæ of Authors (Plate II).

By A. M. EDWARDS. Results of a Microscopical Examination of Specimens of Sand obtained from an Artesian Well.

By H. ENDEMANN and O. LOEW. On the Earth contained in the Zircons of North Carolina.

By GEORGE N. LAWRENCE. A Catalogue of the Birds found in Costa Rica; List of a Collection of Birds from Northern Yucatan; Catalogue of Birds from Puna Island, Gulf of Guayaquil, in the Museum of the Smithsonian Institution, collected by J. F. Reeve; Characters of some new South American Birds, with Notes on other rare or little known Species.

By O. LOEW. On a New Product obtained by the Decomposition of Trichlormethylsulphonbromide; On the Number of Isomeric Bodies.

By J. S. NEWBERRY. Notes on the Later Extinct Floras of North America, with Descriptions of some New Species of Fossil Plants from the Cretaceous and Tertiary Strata; On the Surface Geology of the Basin of the Great Lakes, and the Valley of the Mississippi.

By FELIPE POEY. Review of the Fish of Cuba belonging to the Genus Trisotropis, with an Introductory Note by J. Carson Brevoort; Note on the Hermaphroditism of Fish; New Species of Cuban Fish.

By TEMPLE PRIME. On the names applied to Pisidium, a genus of Corbiculadæ; List of the Species of Mollusca found in the vicinity of North Conway, New Hampshire; Notes on Species of the Family Corbiculadæ, with Figures.

By COLEMAN T. ROBINSON. Lepidopterological Miscellanies (Plate I).

By PAUL SCHWEITZER. On Tribasic Phosphoric Acid; its history, its modes of separation from sesquioxyds, principally from Sesquioxyd of Iron, and its estimation.

By **SANDERSON SMITH** and **TEMPLE PRIME**. Report on the Mollusca of Long Island, N. Y., and of its Dependencies.

By **THEO. A. TELLKAMPF**. Note respecting the Eyes of Amblyopsis spelæus.

By **E. G. SQUIER**. Observations on a Collection of Chalchihuitls from Central America.

The current volume, Vol. X, 1871 to 1873, contains to date, 330 pages and 14 plates, and will be completed in the present year. The following is a list of the articles as far as printed:—

By **GEO. N. LAWRENCE**. Descriptions of New Species of Birds from Mexico, Central America, and South America; with a Note on *Rallus longirostris*.

By **THOMAS BLAND** and **W. G. BINNEY**. Notes on the Genus Pineria and on the Lingual dentition of *Pineria Viequensis*, Pfr.

By **FELIPE POEY**. Genres des Poissons de la Faune de Cuba, appartenant à la Famille Percidæ, avec une Note d' introduction par J. Carson Brevoort. (Plate I.)

By **THOMAS BLAND** and **W. G. BINNEY**. On the Lingual Dentition of Helix turbiniformis, Pfr., and other species of Terrestrial Mollusca. (Plate II.)

By **THEO. A. TELLKAMPF**. Notes on the Ascidea Manhattensis, DeKay, and on the Mammaria Manhattensis. (Plate III.)

By **WILLIAM STIMPSON**. Notes on North American Crustacea, in the Museum of the Smithsonian Institution. (No. III.)

By **GEO. N. LAWRENCE**. Descriptions of three New Species of American Birds, with a Note on Eugenes spectabilis.

By **EDWARD S. MORSE**. On the Tarsus and Carpus of Birds. (With Plates IV and V.)

By **THOMAS BLAND** and **W. G. BINNEY**. On the Systematic Arrangement of North American Terrestrial Mollusks.

By **FELIPE POEY**. Monographie des Poissons de Cuba compris dans la sous-famille des Sparini. (With Plates VI and VII.)

By **GEO. N. LAWRENCE**. Descriptions of New Species of Birds of the Genera Icterus and Synallaxis.

By **THOS. BLAND**. Description of a New Species of Mollusk of the Genus Helicina.

By **TEMPLE PRIME**. Notes on Specimens of Corbiculadæ in the Cabinet of the Jardin des Plantes at Paris, and on the authorship of the Encyclopédie Méthodique.

By **P. FISCHER**. Note sur l' Anatomie des Cyrènes Américaines. (Plate VIII.)

By **THOS. BLAND** and **W. G. BINNEY**. On the Relations of Certain Genera of Terrestrial Mollusca of, or related to the Sub-family Succininæ. with Notes on the Lingual Dentition of *Succinea appendiculata*, Pfr. (Plate IX, in part.)

By **THOS. BLAND** and **W. G. BINNEY**. Description of Hemphillia, a New Genus of Terrestrial Mollusks. (Plate IX.)

By Professor **BENJAMIN N. MARTIN**. Essay upon a Necessary Limitation of the Doctrine of the Unity of the General Forces of Nature.

By **W. J. HAYES**. Description of a Species of Cervus. (Plate X.)

By **THOMAS BLAND** and **W. G. BINNEY**. On the Lingual Dentition of Certain Terrestrial Pulmonata Foreign to the United States.

By **JNO. J. STEVENSON**. The Upper Coal Measures West of the Alleghany Mountains. (Plate XII.)

By **THOMAS BLAND** and **W. G. BINNEY**. On the Lingual Dentition of Gæotis. (With plate XI in part).

By **Thomas Bland** and **W. G. Binney**. Note on a curious form of Lingual Dentition in Physa. (With plate XI.)

By **A. S. Packard**, Jr. Catalogue of the Pyralidæ of California, with descriptions of new Californian Pterophoridæ.

By **A. S. Packard**, Jr. Notes on some Pyralidæ from New England, with Remarks on the Labrador Species of this Family.

By **Jno. J. Stevenson**. Notes on the Coals of the Kanawha Valley, West Virginia.

By **Louis Elsberg**. On the Subdivisions of Science and their Classification.

By **Thomas Bland** and **W. G. Binney**. On Prophysaon, a new Pulmonate Mollusk, on Ariolimax, on Helix lychnuchus and other species. (With Plates XIII and XIV.)

By **Thomas Bland**. On the Physical Geography of, and the distribution of the Terrestrial Mollusca in, the Bahama Islands.

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CONTENTS.

XXX.—On the Lingual Dentition and Anatomy of Achatinella and other Pulmonata. By THOMAS BLAND and W. G. BINNEY. (With Plates XV and XVI.) . . 331

XXXI.—Outlines of a Bibliography of the History of Chemistry. By H. CARRINGTON BOLTON, ... 352

XXXII.—Description of a new Species of Helix, and note on H. Mobiliana, Lea. By THOMAS BLAND, . . . 361

XXXIII.—Catalogue of the Birds ascertained to occur in Illinois. By ROBERT RIDGWAY, ... 364

XXXIV.—Descriptions of Six supposed New Species of American Birds. By GEO. N. LAWRENCE, ... 394

[The Index to Vol. X will be published with the first number of Vol. XI, in May, 1874.]

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XXX.—*On the Lingual Dentition and Anatomy of Achatinella and other Pulmonata.*

BY THOMAS BLAND AND W. G. BINNEY.

Read October 6, 1873.

In the early part of the present year, 1873, Bland especially requested his friend, the Rev. John T. Gulick, who was about to visit the Sandwich Islands, to obtain and preserve in alcohol specimens of different forms of *Achatinella* with the animals, with a view to the examination of their dentition.*

It seemed probable from the differences in the shells, on which alone the subgenera of authors are founded, that variation would be discovered in the dentition, leading to a more satisfactory classification of the species.

Appreciating the value of the proposed examinations, Mr. Gulick, whose stay in the Sandwich Islands was very limited, forwarded to Bland from San Francisco, on his embarking for China, a number of specimens with a list, of which the subjoined is a copy.†

FROM WEST MAUI.

Laminella picta, Mghls. Wailuku.

Auriculella jucunda, Smith. Wailuku.

Amastra Mastersi, Newc. Wailuku.

Leptachatina nitida, Newc. "

" *grana*, Newc. "

FROM EAST MAUI.

Partulina plumbea, Gk. Makawao.

" *eburnea*, Gk. "

Amastra Mastersi, Newc. "

Auriculella solidissima, Smith. Makawao.

---

* At that time the only knowledge we had of the subject was contained in Heynemann's description and figure of the lingual membrane of *A. bulimoides* in Mal. Bl., 1869.

† The following extract from Mr. Gulick's letter is too interesting not to be quoted:

"I find that some of the most abundant species of twenty years ago have now become almost, if not quite, extinct. Some have not been found for many years, though repeated search has been made for them. This has occurred not only where the forests have been destroyed by cattle and by woodmen, but where the sunlight has been let into the close shades by the thinning out of the trees or by the increase of drought. In other places, the various forms of vegetable and animal blight have invaded the forests, proving fatal to the snails long before the trees are destroyed."

FROM OAHU.

Achatinella livida, Swn. Kawailoa.
Amastra decorticata, Gk. " on the ground.
Amastra luctuosa, Pfr. Kawailoa, on the ground.
Amastra nigrolabris, Smith. Kawailoa, on trees.
Leptachatina dimidiata, Pfr. Kawailoa.
Auriculella solida, Gk. Kawailoa.
Bulimella tæniolata, Pfr. Waialae.
Achatinella varia, Gk. "
Apex pallida, Nutt. Makiki.
Achatinella producta, Rv. Makiki.
Achatinella Johnsonii, Newc. Makiki.

The species so sent for examination by Mr. Gulick are in the following list placed in the subgenera adopted by von Martens in the second edition of "Die Heliceen" of Albers. While adopting the subgeneric and specific names employed by Mr. Gulick, explanation is added of Pfeiffer's views from "Mon. Helic. Viv." VI, as to the validity of the species.

It will be seen, however, that, comparatively, the question as to specific names is of little consequence, inasmuch as the differences in forms of jaw and lingual dentition considered in the subjoined remarks are treated as of subgeneric and not of specific value.

1. PARTULINA, Pfr., p. 243 of "Die Heliceen."
    - *Auriculella jucunda*, Smith, ... W. Maui.
    - " *solidissima*, Smith, ... E. Maui.
    - " *solida*, Gulick, ... Oahu.
      (syn. of splendida, Newc. teste Pfr.)
    - *Partulina plumbea*, Gul., ... E. Maui.
      (syn. of marmorata, Gld., teste Pfr.)
    - " *eburnea*, Gul., ... E. Maui.
      (syn. of Tappaniana, Ad., teste Pfr.)
    - *Apex pallida*, Nutt., ... Oahu.
    - *Bulimella tæniolata*, Pfr., ... Oahu.
      (section *b* of Partulina, v. Mart.)
2. BULIMELLA, Pfr., p. 244.
    Not represented among the Gulick shells.
3. ACHATINELLA, s. str., p. 246.
    - *A. livida*, Swains., ... Oahu.
      (var.? of vulpina, Fér. teste Pfr.; placed by v. Martens in this subgenus.)
    - *A. varia*, Gul., ... Oahu.
      (syn. of vulpina, Fér. teste Pfr.; of fulgens, Newc. teste v. Mart.)

A. producta, Rv., ... Oahu.
A. Johnsonii, Newc., ... Oahu.

4. Apex, Alb. and v. Mart., p. 248.
Not represented in the Gulick shells.
[*Apex pallida*, Nutt., see above under Partulina, is treated by Pfr. as syn. of lorata, Pfr., non Fér. of the subgenus Achatinella s. str., while von Martens puts it in the syn. of lorata, Fér., in the subgenus Partulina.]

5. Newcombia, Pfr., p. 249.
Laminella picta, Mghs., ... W. Maui.

6. Laminella, Pfr., p. 250.
Amastra Mastersi, Newc., ... E. and W. Maui.
(syn. of rubens, Gld. teste Pfr.)
Amastra decorticata, Gul., on the ground, . . . Oahu.
" *luctuosa*, Pfr., " " " . . . "
" *nigrolabris*, Smith, on trees, ... "

7. Leptachatina, Gould, p. 251.
L. nitida, Newc., ... W. Maui.
L. grana, Newc., ... W. Maui.
L. dimidiata, Pfr., ... Oahu.

8. Labiella, Pfr., p. 252.
Not represented among the Gulick shells.

The specimens were forwarded to Binney, the result of whose anatomical examinations are given below in detail. It may be stated here, however, that both in form of jaw and character of the lingual dentition, all the species of *Partulina* and *Achatinella* s. str. sent by Mr. Gulick agree. They all share a form of dentition quite uncommon in the *Helicidæ*. Of the same type of dentition is *A. bulimoides* examined by Heynemann. (See pl. xv, fig. 11.)

The jaw and lingual dentition of all Mr. Gulick's species of *Newcombia* and *Laminella* are alike, thus indicating a separate group for these subgenera. The lingual membrane shows the usual type of *Helicinæ*, but the central tooth is quite narrow. (See pl. xv, figs. 9–11.)

Similar to the last group in the form of jaw and character of central and lateral teeth are all the species of *Leptachatina* received from Mr. Gulick. They have, however, a different form of marginal tooth, distinguished by the blunt digitation of the reflected apex of the tooth (see pl. xv, fig. 8), which in *Newcombia* and *Laminella* is simply bidentate or tridentate. This peculiar marginal tooth reminds one forcibly of that figured for *Partula* by Heynemann (Mal. Blatt. 1869), though the apex in his figure is not reflected as in *Leptachatina.*

Thus it appears that three groups are indicated by the forms of lingual dentition in the genus *Achatinella.*

a. *Partulina*, *Achatinella* s. str.
b. *Newcombia*, *Laminella.*
c. *Leptachatina.*

As regards the subgenera not represented among Mr. Gulick's specimens, judging from the shell alone, it would appear that *Bulimella* and *Apex* belong to the group *a*, while *Labiella* will prove to belong rather to *b* or *c* than to *a.*

In the subjoined remarks on the anatomy of the genus it will be shown that there is another peculiar character, the division of the ovary (albumen gland of Moquin-Tandon) into long, wavy, delicate, thread-like cæca. No doubt this is a generic character, so constant was it in all of Mr. Gulick's specimens examined, both of sections *a* and *b* indicated above.

In this connection it is interesting to state that Mr. Gulick, in his paper "On the Variation of Species as related to their Geographical Distribution, illustrated by the Achatinellæ," (Nature, July 18, 1872), states as follows: "The family is divided into two natural groups of genera. The first group consists of seven genera: *Achatinella*, *Bulimella*, *Helicterella*, *Partulina*, *Newcombia*, *Laminella* and *Auriculella.* These are all arboreal in their habits. In form they are sinistral, or both dextral and sinistral. The second group consists of three genera: *Amastra*, *Leptachatina* and *Carelia.*[*] With but few exceptions, the species of *Amastra* and *Leptachatina* live on the ground and are of dextral form."

This division, apparently based more especially on the sinistral or dextral characters of the shells, and arboreal or terrestrial habits of the animals, is evidently faulty, seeing that, irrespective of such characters and habits, the *Achatinellæ*, dentition considered, may be very properly divided into two, perhaps three, subgênera, alike embracing forms comprised in each of Gulick's groups.

---

[*] **Carelia, H. and A. Ad., a subgenus of *Achatina*, teste von Martens.**

The details of anatomy here follow.*

In *Laminella Mastersi* the jaw is low, wide, slightly arcuate, ends but little attenuated, blunt; it is of horn color, thickest on the cutting edge, gradually thinning off to the upper margin. There is no median projection to the cutting edge. The anterior surface is without ribs. Of the same type is the jaw in all the species of *Laminella* examined It is very wide, very low, and hardly arcuate in *luctuosa*. I find the same type of jaw also, though much more arched, in all the species of *Newcombia* and *Leptachatina* examined. In *picta* there is a slightly produced, blunt, median projection to the cutting edge. All these species have jaws readily boiled out by caustic potash, and usually remaining attached to the lingual membrane in the test tube after the process. There are delicate vertical striæ on several of them, sometimes shown only by a very strong power. In all the other species submitted to me the jaw is so extremely delicate as to be found with difficulty. I failed to extract it in *Achatinella Johnsonii*, *livida* and *varia.*† In the other species of *Achatinella*, and in all of *Partulina*, the jaw appears to be simply arcuate, transparent, extremely thin, ends blunt.

The lingual membrane is of the same type as figured for *Partulina bulimoides* by Heynemann (Mal. Blatt. XIV), in all the species of *Achatinella* s. s., and *Partulina*. It is very broad in comparison to its length. In one specimen the formula is 175–1–175.‡ The teeth are arranged *en chevron*. There is but one type of teeth for centrals, laterals and marginals, the former being, however, somewhat smaller, and symmetrical The teeth are long, narrow, bluntly truncated below, curving and widening at first gradually, then more rapidly, so that the apex is more than twice the breadth of the base; it is reflected along its whole breadth, slightly produced, seven-cuspid, the central cusp the smallest. There is variation in these cusps.

In *Newcombia*, *Laminella* and *Leptachatina* the lingual membrane is entirely different. It is as usual in the *Helicinæ*, narrow compared with its length, the teeth arranged in horizontal rows. The centrals are long, narrow, somewhat wider at base (where there are two long, parallel, longitudinal lines of reinforcement), again enlarged at apex, which is reflected, slightly produced, and bluntly tricuspid, the outer cusps almost obsolete. The lateral teeth are subquadrate, more than twice as broad as the centrals, the reflected portion greatly produced and bicuspid. There are about eight perfect lateral teeth in *Leptachatina grana*, the formula being 20–1–20. In *Laminella luctuosa* the formula is about 22–1–22. In *L. Mastersi* 26–1–26, with eight perfect laterals. The marginal teeth in *Laminella* are merely a simple modification of the laterals, they are low, subquadrate, with one long, oblique, blunt inner denticle and two smaller, outer denticles. In *Laminella* the denticles are more numerous and more pointed. In all the *Leptachatina* the marginal teeth are of a different type. They seem to have but one very broad cusp, whose outer edge is irregularly digitate or fringed, the points being about eight, but varying in number and position.

---

* I alone am responsible for these anatomical details.—W. G. B.

† The process of extraction by potash is not adapted to this slightly developed jaw; even by dissection it is very difficult to obtain the jaw; when mounted in glycerine jelly it speedily becomes too transparent to be studied under the microscope.

‡ Counted by my young friend A. Ten Eyck Lansing, to whom I am indebted for valuable aid in dissecting the specimens.

To illustrate the jaws and lingual membranes I have selected (fig. 10) one central and one lateral of *Laminella Mastersi*, a group of centrals and laterals of the same (fig. 11), with a group of marginals of the same (fig. 9.) Fig. 2 gives one central and several adjacent laterals, from either side, of *Achatinella producta*. Fig. 8 gives several marginal teeth of *Leptachatina nitida*. Fig. 7, the jaw of *Laminella Mastersi*. Fig. 6, the jaw of *Laminella picta*.

It will be noticed that the lingual membrane of *Newcombia*, *Laminella* and *Leptachatina* resembles that of *Stenogyra* in its extremely small central tooth. The jaw also is of the same type.

The following species were found with embryonic shells in the oviduct, usually only two in number and of very unequal size, *Newcombia picta*, *Laminella decorticata*, *luctuosa*, *Partulina eburnea*, *tæniolata*, *Achatinella producta*. Heynemann, *l.c.*, found them also in *bulimoides*.

A peculiarity of the genus seems to be a perfectly black lung, in great contrast to which are the two divisions of the heart and the renal organ, all decidedly white.

Another peculiarity of the genus is a short foot, broad in front, rapidly narrowing towards the pointed tail. In *Partulina pallida*, however, the tail is long. Also in *Partulina eburnea*. In many of the specimens I noticed an unusual development of the blind sac under the mouth (supposed by Dr. Leidy to be the seat of the olfactory nerve). I believe this to be a generic characteristic also.

I noticed nothing unusual in the nervous ganglia, or in the digestive apparatus, examining each system carefully in several species, the upper portions of the digestive system especially in *Partulina pallida*.

The reversion of the shell, common in the genus, seems accompanied by a corresponding sinistral arrangement of the internal organs. Thus the orifice of generation, usually on the right of the animal in the snails, is, in the sinistral *Achatinellæ*, on the left. I have verified this fact in *eburnea*, *varia*, *livida* and *Johnsonii*.

So far as can be judged from alcoholic specimens, it seems that the external orifice of the generative organs is usually under the mantle, not behind the tentacle; this I believe to be a generic characteristic, but the fact must be confirmed in the living animal. It must surely be so in many species, among which I may mention *Johnsonii* and *tæniolata*. It is not so, however, in *pallida*.

Another peculiarity is the whiteness noticed in the internal organs of almost all the species examined. The whole digestive system seemed injected with a dead white fluid.

The generative system presents several peculiarities, but in its general arrangement is the same as in the other shell-bearing snails. The testicle is embedded in the extreme apex of the shell, in the upper lobe of the liver. The epididymis is long, greatly convoluted near the oviduct. The accessory gland appeared in several species (for instance in *Mastersi*, *varia*, *tæniolata* and *producta*) to be composed of several long, white cæca. This appears to be a generic characteristic, as does also the peculiarly constituted ovary.*

Instead of the single, homogeneous, tongue-shaped mass usually seen in the *Pulmonata*, I have invariably found the ovary in *Achatinella* to be composed of numerous, long, delicate, crimped, thread-like cæca, free excepting at their base, where they converge to the top of the oviduct, I noticed this form of ovary in *tæniolata*, *Johnsonii*, *pallida*, *livida*, *varia*, *eburnea*, *Mastersi* and *luctuosa*, besides other species less thoroughly examined. The cæca are bound together in one irregularly ovate mass by an investing membrane, which, when opened, allows the cæca to spread out in the form represented in pl. xv, fig. 4. This peculiar ovary is the most interesting point in the genus, so unlike the corresponding organ in the other snails whose anatomy is now known. The oviduct is not convoluted, but simply long and sac-like (with extremely thin sides), ending in a narrow, tubular cloaca. The remaining organs were not readily examined, on account of the animals having apparently been boiled, or otherwise rendered difficult of dissection without breaking the continuity of several of the ducts and organs, though the same general arrangement (especially as to inter-connection) of penis, vas deferens, etc., was noticed by me in *tæniolata*, *livida*, *varia*, *eburnea* and *pallida*.

I have given a figure of the genitalia of one species only, *A. producta*, which I succeeded in retaining in perfect condition. It will be noticed (fig. 4) that the *vas deferens* proceeds directly from the base of the ovary and is free in its whole length, though lying close upon the oviduct. It enters the penis at its side, just below its apex. From the apex of the penis sac is a delicate duct to the long organ marked *a* on the figure. This organ runs from the base of the ovary to the apex of the sac-like organ marked *b*. As there appears to be no prostate gland along the side of the oviduct, it occurs to me that the organ *a* may be a form of prostate, lubricating both the penis and the organ marked *b*. The last is a dart sac, or a prostate, probably the latter. Its long flagellum

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*I use the terms applied to the organs by Dr. Leidy in "Terrestrial Mollusks of United States," I.

(*c*) in its natural position lies as in fig. 5, directly under the respiratory cavity, over the other genital organs. The genital bladder (*d*) was found almost embedded in the ovary.

Nanina Chamissoi, Pfr.

With the *Achatinellæ* were specimens of a small *Nanina* from Oahu and another species from West Maui. The latter is pronounced by Dr. Newcomb to be young of the above named species. Both of these species have similar lingual teeth. Those of the West Maui species are figured in pl. xv, fig. 3. The centrals and laterals are as usual in the genus; there are ten perfect laterals. The marginals are aculeate, but instead of the usual simply bifid point, they have three and four points. The tooth figured was the very last on the edge of the membrane. No perfect jaw was obtained in either species, though a simple arcuate smooth jaw was recognized in that from Oahu, of too extreme delicacy to be satisfactorily studied.

The species belongs to the subgenus *Microcystis*.

Succinea canella, Gld.

From West Maui also was this species of *Succinea*, whose jaw and lingual membrane are as usual in the genus.

Zonites Gundlachi, Pfr.*

Mr. A. Schramm, Guadeloupe. The species is also found in Florida and several of the W. I. Islands.

Jaw not examined.

Lingual membrane arranged as usual in the genus. Centrals tricuspid, laterals bicuspid, about seven of the latter being perfectly shaped laterals. Marginal teeth aculeate, of the form usual in the genus, but bifid, and sometimes trifid (see pl. xv, fig. 1). The species is viviparous.

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* This species, like *Z. fulvus* (L. & F.W. Shells N. A., I, 47, fig. 75), differs from *Zonites* in the bifurcation of the marginal teeth of its lingual membrane. It must be compared to *Vitrinoconus*, Semper, Phil. Arch., p. 91.

Stenopus has teeth arranged as in *Glandina*, with no laterals. Our species cannot therefore belong to it.

Helix uvulifera, Shuttleworth (*Polygyra*).

Sarasota Bay, Florida, Dr. W. Newcomb.

Jaw low, arcuate, ends blunt, anterior surface with about thirteen ribs, denticulating either margin.

Lingual membrane as we have figured for *H. auriculata.* (Land and Fresh Water Shells, I, p. 87, fig. 158.)

Veronicella occidentalis, Guilding.

Guadeloupe, Mr. A. Schramm.

Jaw and lingual membrane as usual in the genus, the former with about thirty ribs. (See Amer. Journ. of Conch., VII, 163, pl. xii, fig. 7 and L. and F. W. Shells, I, p. 304, fig. 539.)

The head, eye-peduncles and tentacles of the specimens, preserved in alcohol, were entirely withdrawn, the aperture through which they withdrew being very conspicuous. The tentacles and eye-peduncles are contractile, as described. There appears, properly speaking, to be no distinct locomotive disk to the foot. Such a disk has been described for the genus, owing to authors considering the reflected edges of the mantle as portions of the foot. These give, indeed, a tripartite appearance to the base of the animal, but the foot itself is not divided.

Onchidium Schrammi, nov. sp.

In the absence of any satisfactory published figure of the lingual dentition of the genus *Onchidium,* we give on pl. xvi, figs. 3–5, figures of that of a species sent to us by Mr. A. Schramm, from Pointe à Pitre, Guadeloupe. He collected many specimens, thus describing their station. "Sous des galets au bord de la mer, dans la rade de la Pointe à Pitre, en société avec des Nerites, des Auricules et des Pedipes."

The external appearance of the species, which may be called after the discoverer, is as usual in the genus. The body is elliptic in shape, green in color, about eighteen millimeters long (contracted in spirits), flat below, convex above, with a rounded slightly prominent ridge along the back, on which the skin is smoother than on the balance of the body, and where the tuberosities are much less conspicuous. The foot has no proper locomotive disk, though the broadly reflected mantle edge has usually been counted as a portion of the foot and has given rise to the impression that the foot of *Onchidium* is divided into three longitudinal bands, of which the central is a locomotive disk. The eye-peduncles are surely retractile, being found completely inverted in all the specimens examined. This confirms the recent observations of Dr. Stoliczka.*

We found no jaw in the specimens.

The lingual membrane is broad. The teeth are arranged *en chevron.* They are crowded closely together, the individual teeth and separate rows of teeth overlapping each other. The central tooth has somewhat the outline of a truncated cone, narrow and squarely truncated above, gradually widening and curving outward toward the base, which is much broader than the top, and is incurved with acutely pointed corners. The top of the tooth projects beyond the reflected cutting edge, which is small and tricuspid. The first lateral is about the same size as the central. Its squarely truncated apex extends beyond the reflected cutting edge, which is bicuspid, the outer cusp subobsolete, the inner much larger and extended into a long, broad, squarely truncated point, reaching almost to the base of the tooth. This last is hidden behind the central, is long and gradually attenuated to its blunt base. The second lateral is of same shape as the first, but one-half longer and larger, the third and fourth laterals also increase in like proportion. The general direction of all the laterals is a curve outward from the central. There are no distinct marginal teeth.

Fig. 5 (pl. xvi) gives a group of centrals and laterals from two adjacent rows of teeth. Fig. 3 shows one central with its adjacent two laterals more enlarged, and purposely separated. Fig. 4 shows one lateral in profile.

This lingual is instructive from showing a combination of the characters of the quadrate teeth of *Helicinæ* and the aculeate teeth of *Vitrininæ*, the last most evident in the profile. In profile, however, the reflected cusp is not of the sharp, thorn-like character of *Vitrina*, *Zonites*, etc. We should rather consider the teeth as decidedly quadrate, the base of attachment, or plate, being extended beyond the top of the reflected cusp.

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* Many years ago the eye-peduncles of *Onchidium* were described as retractile by Forbes and Hanley, yet of late years most authors have treated them as contractile, as in *Veronicella*.

We are indebted to our young friend A. Ten Eyck Lansing for assistance in the study of this lingual.

Heynemann's figure of the dentition of *Peronia* (*Onchidella*) is somewhat similar to that described above, at least in the general form and arrangement of the teeth. (Mal. Blatt., 1868, XV, pl. iii, fig. 10.)

Helix picta, Born (*Polymita*).

A Cuban species. The specimen examined was captured on a bunch of bananas in New York by Mr. M. Brandigee, who kindly sent it to Bland.

Jaw (pl. xvi, fig. 1) thick, arched, high, ends bluntly rounded, but little attenuated; anterior surface without ribs; cutting edge without median projection; a transverse, median line of reinforcement.

Lingual membrane (pl. xvi, fig. 2) long and broad. Teeth arranged strongly *en chevron*, of uniform shape on all parts of the membrane. Centrals long, narrow, bluntly truncated at top, slightly incurved at sides, rounded and fringed at base, near which is the gouge-shaped, expanded, tricuspid cutting edge. The central cusp is bluntly rounded, the exterior cusps curve outward and are pointed. The lateral teeth are of the same form with the centrals, but are slightly unsymmetrical. There are no distinct marginal teeth.

By its jaw and lingual membrane, *Helix picta* is closely allied to *Helix muscarum*, Lea (see Amer. Journ. of Conch., VI, 204, pl. ix, figs. 4, 16). The last named species is, however, placed by von Martens in the subgenus *Polymita* and *picta* in *Liochila*. There can be no doubt that both species belong to the same subgenus, but as *Helix muscarum* is the type of *Polymita*, that name must be retained instead of *Liochila*. We anticipate finding the same curious type of lingual dentition in *H. sulphurosa*, Morel. (which is scarcely distinguishable from *H. picta*), also referred to *Liochila* by von Martens, but are scarcely prepared to expect it in *Liochila Jamaicensis*, Chem. The latter, which is the type of *Liochila*, will therefore remain undisturbed in its systematic position, unless, indeed, it belongs to *Thelidomus*, in which case the name *Liochila* will be placed in the synonymy of the last named subgenus. Of the species referred to *Polymita* we presume none will prove to have similar dentition unless, as may probably be the case, *H. versicolor*, Born, so that the others must all be removed from *Polymita*, to form a distinct subgenus under the name of *Hemitrochus*, Swainson, 1840. We have, however, ourselves examined only *H. varians*, Mke., *Troscheli*, Pfr., *gallopavonia*, Val., and *graminicola*, Adams, all of which have the usual form of lingual teeth of the *Helicidæ* (see Amer. Journ. Conch., VI, 206, VII, 178, and L. and F. W. Shells, N. A., VI, 185, fig. 325). The jaw offers no subgeneric character to distinguish the two subgenera *Polymita* and *Hemitrochus*.

The long, subquadrangular lingual tooth, not reflected along its upper margin as usual in the *Helicidæ*, but bearing the gouge-shaped, expanded, cutting edge, soldered as it were upon its surface, has never been noticed by us before in the genus *Helix*. It is, however, characteristic of *Orthalicus*,* of *Gæotis*,† and of the marginal teeth of *Liguus*.‡

Our fig. 1, of pl. xvi, represents the jaw of *H. picta*. Fig. 2 gives two central teeth of the lingual membrane with the adjacent laterals.

Helix gallopavonis, Val. (*Hemitrochus*).

Jaw as in *Helix varians* (see L. and F. W. Shells, I, p. 185, f. 325) and *H. Troscheli* (herewith described).

Lingual membrane as usual in the *Helicidæ*. Cusps of centrals and laterals stout, short, with short points; side cusps subobsolete. The reflected cutting portion of both centrals and laterals does not reach beyond the middle of the plates, which are very long. Marginal teeth low, wide, with four or more short, oblique, bluntly rounded denticles, the two inner ones the largest.

We are indebted for the specimen examined of this Turk's Island species, and the following one from New Providence, Bahamas, to Governor Rawson.

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* See Amer. Journ. Conch., VI, 212, 213, pl. ix, figs. 2, 10, 12.

† See Ann. N. Y. Lyc. Nat. Hist., X, 252, pl. xi, figs. 5, 6, 7.

‡ See Amer. Journ. Conch., VI, 209, 211, figs. 4, 5.

Helix Troscheli, Pfr. (*Hemitrochus*).

Jaw stout, decidedly arched, high, ends attenuated, blunt; a decided, small median projection to cutting edge, a strong transverse line of reinforcement.

Lingual membrane as usual in the genus. Centrals very long, the reflected cutting edge greatly produced above and not extending to the base of the plate, side cusps obsolete, median cusp with a short point. Laterals like the centrals, but unsymmetrical, the upper portions still more produced. Marginals quadrate, with one large, oblique, rounded, bluntly bifid denticle, and one or two small, blunt, side denticles. The membrane is peculiar in the extension of the centrals and laterals at their upper margin.

Amphibulima (Succinea) appendiculata, Pfr.

We have already fully described (Ann. Lyc. N. H. N. Y., X, 206, pl. ix, f. 2, 6, 9-11) the external appearance, jaw, lingual membrane and shell of this species, pointing out its differences from *Succinea*, from *Pellicula*, from *Omalonyx* and all other described genera, but hesitated to decide upon its generic position, leaving it temporarily in *Pellicula* of Fischer (not of Heynemann which is *Omalonyx*).

Being now better acquainted with the jaw of *Amphibulima* and finding that of our *appendiculata* (believed by us to be the *appendiculata* of Pfeiffer) of the same type, we place the species in *Amphibulima*.

Its lingual dentition more closely resembles that of *Simpulopsis sulculosa*, so far as centrals and perhaps laterals are concerned, but in the marginals, as described in *S. sulculosa* and *S. Portoricensis*, the resemblance ceases.

Moreover *A. appendiculata*, Pfr. cannot be placed in *Simpulopsis*, the jaw of which, according to Shuttleworth, is quite different.*

Fischer bases his genus *Pellicula* on *Succinea depressa*, Rang, in the synonymy of which he has *S. appendiculata*, Pfr., but the specimens of the latter under our consideration cannot be the same as Fischer's of *depressa*. His specimens are described as having a jaw with nine decided ribs* denticulating the cutting edge and teeth of the usual form of the *Helicinæ*—quite different from our *appendiculata*, which is, we believe, distinct from his species.

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* See Bland and Binney, Ann. Lyc., X, 198.

Pellicula convexa, Martens (*Succinea*), belongs to the genus *Omalonyx*, as shown by Heynemann's figure of the jaw (Malak. Blatt., XV).

Amphibulima patula, Brug.

We have elsewhere described the lingual membrane of this species from a Dominica specimen (Am. Journ. Conch., VII; 186, pl. xvii, f. 1, 2,) and the jaw of one from St. Kitts (Ann. Lyc. N. H. N. Y., X, 225, pl. xi, f. 8).

It has lately been suggested by Schramm (Journ. de Conch., XIII, 127, April, 1873) that this species belongs exclusively to the fauna of Guadeloupe, and does not exist in the neighboring islands. We have seen one fossil example only from Guadeloupe, but on comparing it with fresh specimens from St. Kitts and Dominica are satisfied, judging from the shells, that all are of one and the same species.

Considering Schramm's views, we have again carefully examined the lingual membranes already described of the St. Kitts and Dominica forms, to ascertain whether they present differences of specific value. It may be mentioned that the shells from the latter island, several of which are in the cabinet of the late Mr. Robert Swift, are smaller than those from St. Kitts.

We find that the Dominica form has sharper cutting points to the large cusps of its central and lateral teeth than in the St. Kitts' examples, while the laterals of the latter show greater constancy in the square truncation of the cutting points.

The teeth of the St. Kitts linguals are broader in proportion to their length, have a greater curve in their outlines and more developed side cusps, which overlap the median cusps, than in those from Dominica.

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* In Fischer's plate the references to the teeth of *Omalonyx unguis* and *Pellicula depressa* are reversed.

The marginal teeth of the former exhibit a greater tendency to splitting into sharp denticles on the cutting cusps than those of the latter island.

The Dominica lingual, in the only row counted, has 87–1–87 teeth, one in the St. Kitts form has 57–1–57.

These differences in the lingual membranes are noticeable, but we believe, especially as the shells are identical, that they are not of specific value.

Amphibulima (Succinea) rubescens, Desh.

We are indebted to Governor Rawson for specimens (preserved in alcohol) of this species from Martinique.

On examination of the jaw and lingual membrane, we found that the species is not a *Succinea*, but an *Amphibulima*,* in which genus it is placed by Beck (Index, p. 98) and by H. and A. Adams (Gen. Rec. Moll., 129), although Pfeiffer treats it as a *Succinea* and v. Martens (Die Heliceen, ed. 2nd, 310) catalogues it in *Succinea* s. str.†

The jaw agrees perfectly with that of the genus *Amphibulima* described by us (Ann. Lyc. N. H. N. Y., X, p. 225, pl. xi, fig. 8). There are about sixty delicate ribs. The lingual membrane has also the same general arrangement as in that genus (*l.c.*, fig. 9) with specific differences from that of *A. patula*, especially in the widely expanded, blunt, median cusp of the central tooth, and in the *Succinea*-like cutting away of the lower margin of the teeth. The marginal teeth of *A. rubescens* resemble those we have figured of *Gæotis* (*l.c.*, pl. xi, fig. 7).

A. rubescens occurs also in the environs of Cayenne (Drouet, Moll. de la Guyane Française, p. 49).

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* See our note on p. 345 of Journal de Conchyliologie, XIII, Oct., 1873.

† Since sending the above to the printer, we have received the Journal de Conchyliologie, 3d series, XIII, No. 4, Oct., 1873. On p. 324, is a description of the jaw and anatomy of this species by Dr. Fischer, who suggests the subgeneric name *Rhodonyx*, overlooking its generic identity with *Amphibulima*.

Omalonyx felina, Guppy.

We have received, from Mr. R. J. Lechmere Guppy, specimens preserved in glycerine of his *Amphibulima* (*Omalonyx*) *felina*, from Trinidad. On examining the jaw and lingual membrane, we find the species to be a true *Omalonyx*, both organs being the same as have been described for that genus. (See Ann. N. Y. Lyc. Nat. Hist., X, 203, *O. unguis* of Brazil and Guadeloupe.)

We have already (*l.c.*, p. 204) stated our belief that *O. felina*, judging from the shell alone, is specifically identical with the Guadeloupe *O. unguis*.

Lithotis rupicola, Blanford.

Sometime since Bland was indebted to Colonel Jewett for specimens of this interesting species, from one of which he obtained the jaw and lingual membrane.

Pfeiffer (Nov. Conch., IV, pp. 11 and 12, pl. cxii, figs. 1–4) describes and figures *Succinea rupicola* Blanford (subgenus *Lithotis*) quoting the name from the catalogue of Dr. Dohrn's collection, remarking that he had no information as to the work in which the subgenus and this, the typical species,* had been characterized.

The shell has a certain similarity to that of *Succinea* but the species does not belong to the Elasmognatha.

L. rupicola is found on rocks at an elevation of 2,000 feet in the mountains near Bombay.

The jaw is arcuate, with a depression or excavation at the centre of its upper margin; scarcely attenuated towards the ends; cutting edge with a decided median projection; anterior surface with vertical striæ, but no trace of ribs.

The lingual membrane is as usual in the *Helicinæ*, the marginal teeth being quadrate, not aculeate. The centrals are long and narrow, with lateral expansions at the lower margin; the reflected portion has one stout median cusp with a point reaching nearly to the lower margin of the tooth, the side cusps being subobsolete. The lateral teeth are like the centrals, but unsymmetrical. The marginal teeth are about as wide as high, with one stout, pointed inner cusp, and two short, side cusps.

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* *Succinea* (*Lithotis*) *tumida* was described and figured by Blanford in Journ. As. Soc. Bengal, 1870. See also Nov. Conch., *l.c.*

Helix provisoria, Pfr. (*Thelidomus*).

New Providence, Bahamas (also Cuba). Gov. Rawson.*

Jaw very slightly arcuate, wide, low, of about equal height throughout; ends blunt; anterior surface with 10–15 ribs, separated by irregular intervals, not always reaching the cutting edge, which has a broad, blunt median projection.

Lingual membrane with numerous rows of about 40–1–40 teeth, as usual in the *Helicidæ*, the marginals having one large and one side, small, blunt cusp, projecting but slightly beyond the base of the tooth.

Glandina solidula, Pfr. (*Oleacina*).

New Providence (also Cuba).

Lingual membrane as usual in the genus.

Bulimulus sepulcralis, Poey (*Leptomerus*).

New Providence (also Cuba).

Jaw stout, wide, low, arcuate, of about equal height throughout; ends bluntly rounded; with fifteen stout, broad, crowded ribs, their ends crenellating either margin. Some of these ribs are of equal thickness throughout their whole breadth, and are separated by decided narrow interstices. The jaw cannot, therefore, be said to be in numerous plate-like sections separated by narrow ribs, as is usual in *Bulimulus*. This jaw is of interest as showing the passage from the jaw of *Cylindrella*, *Bulimulus*, etc., to that of *Helix*, having some of the characters of each.

Lingual membrane as usual in the *Helicidæ*. Side cusps of centrals and laterals obsolete, median cusp long, with a long point, passing beyond the base of the tooth. The upper margin of the centrals is incurved. Marginal teeth a modification of the laterals, with one long, narrow, blunt, inner denticle, and one or two short side denticles of similar shape.

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*The animals of this, the four following, and other Bahamas species were sometime since received from Gov. Rawson by Bland, to whom the shells collected by the late Dr. Bryant were referred by the Boston Society of Natural History. The jaws and lingual membranes of the species were placed by Bland at the disposal of the society, and at his suggestion were mounted for microscopic examination. We are indebted to the Society for the use of the slides.

Strophia decumana,[*] Fér.

Castle Island, Bahamas.

Jaw stout, strongly arcuate, ends slightly attenuated, bluntly rounded; anterior surface ribless, transversely striate, and with several stout lines of reinforcement; a small, blunt, median projection to cutting edge. (See our fig. 431, p. 247, of L. and F. W. Shells, I, for jaw of *S. incana.*)

Lingual membrane as usual in the *Helicidæ.* Teeth about 30–1–30, about as broad as long, short, broad, with short, stout, bluntly pointed median cusps and subobsolete side cusps, upper margin of teeth rounded. Marginal teeth simply a modification of the lateral, with one inner, large, and one outer, small, stout, blunt, oblique denticle.

Strophia Mumia, Brug. var.?

Abaco, Bahamas (also Cuba).

Jaw slightly arcuate, stout, rough, rather high, ends but little attenuated, blunt; cutting edge with a wide, blunt, slightly developed median projection.

Lingual membrane with about 30–1–30 teeth. Centrals short and broad, the upper margin rounded and reflected into a short, broad cutting projection, with one stout, short, median cusp, bearing a stout point, and subobsolete side cusps. Laterals like the centrals, but bicuspid and unsymmetrical. Marginals long, low, with irregular, short, blunt, oblique, stout denticles, usually about four, the inner two the largest.

Pupa fallax, Say (*Leucochila*).

We are indebted to Mr. A. G. Wetherby for Ohio specimens, from which we extracted the jaw and lingual membrane here described.

Jaw wide, low, slightly arcuate, ends blunt, but little attenuated.

Lingual membrane as usual in the genus. (See our L. and F. W. Shells of N. A., I, p. 233, figs. 395, 401, 409.) Teeth about 15–1–15, with about seven perfect laterals. Centrals quite narrow, the reflected portion very small, tricuspid. Laterals quite broad, bicuspid. Marginals quadrate, low, wide, with one inner, long, oblique, blunt denticle, and several outer, small, irregular, blunt denticles. The outer lower edges of the centrals and laterals have the projecting or short reinforcements shown in the figures referred to above.

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[*] See remarks on this species by M. Crosse, in Journ. de Conch, VIII, 3d Ser., p. 337, 1868.

Though we retain the species in the genus *Pupa* it must be remembered that as treated by Pfeiffer it would be placed in *Buliminus* of Albers and Martens. In general form of shell it certainly approaches *Buliminus montanus*, Drap.

Limax Hewstoni, J. G. Coop.

San Francisco, received from Mr. Stearns. We presume the specimens belong to this species.

Jaw and lingual membrane as usual in the genus. No bifurcation to the marginal teeth. Teeth about 30-1-30, with fourteen perfect laterals. The teeth are quite of the shape of those figured on p. 59 of our L. and F. W. Shells. The side cusps of the centrals and laterals are well developed.

Erinna Newcombi, A. Ads.

In the collection of the late Mr. Robert Swift, presented by his daughter, Mrs. A. L. Washburne, to the Academy of Natural Sciences of Philadelphia, but temporarily in the charge of Bland, he found specimens of this species, given to Mr. Swift by Dr. Wesley Newcomb.

The genus *Erinna*, referred to the family *Limnæidæ*, was described by H. and A. Adams, in the Zool. Proc., 1855.

The authors remark, "This shell (*E. Newcombi*) by some would be referred to *Neritina*, by others to *Limnæa*, and possibly by a few to the genus *Otina*; it appears, however, to be distinct in character from all these."

From one of the specimens in the Swift collection the jaw and lingual membrane here described were obtained.

To satisfy himself as to the shells, Bland sent one for examination to Dr. Newcomb, who in reply has kindly furnished the following information as to the habitat and station of the species :—

"The specimens were forwarded by me to Mr. Swift in about 1852 or 1853. They were collected high up the stream called the Hanelei River, on the Island of Kauai. At a fall in this river, the spray is thrown over the rocks, keeping them constantly wet; from these rocks the shells were taken.

On repeated subsequent visits to the same locality I failed to find any more."

The jaw is low, wide, slightly arcuate, ends pointed; a decided median projection to the cutting edge; anterior surface smooth. There is no appearance of a supplementary plate as in *Succinea.*

The lingual membrane is as usual in the *Helicinæ.* The central tooth is long and narrow, small in proportion to the laterals, the reflected portion has one long median cusp, the side cusps being subobsolete. The lateral teeth are wide, broad as long, the reflected portion almost as large as the whole base of attachment, and tricuspid, the inner cusp very small, the median cusp large and bluntly truncated, the outer cusp smaller than the median and bluntly pointed. The marginal teeth are subquadrate, wider than high, the apex reflected, obliquely produced and bearing five or more blunt, short denticles, of which the inner two are the largest.

This description proves that the species is more nearly related to *Pupa*, *Clausilia* and *Stenogyra* than to *Succinea* among the *Helicidæ*, but it may well prove to be a Limnæan, as suggested by H. and A. Adams. As such it must be compared to *Pompholyx.*

EXPLANATION OF PLATE XV.

Fig. 1. *Zonites Gundlachi*, Pfr. One marginal tooth of the lingual membrane.

Fig. 2. *Achatinella producta*, Rve. One central and adjacent lateral teeth.

Fig. 3. *Nanina Chamissoi*, Pfr. (See p. 338.) One central, one lateral and one extreme marginal.

Fig. 4. *Achatinella producta*, Rv. The genital system enlarged. *a*, see p. 337. *b*, Vaginal prostate? *c*, Flagellum of same. *d*, The genital bladder.

Fig. 5. Same as *c* of fig. 4, as it lies in the animal.

Fig. 6. *Newcombia picta*, Mighels. Jaw.

Fig. 7. *Laminella Mastersi*, Newc. Jaw.

Fig. 8. *Leptachatina nitida*, Newc. Marginal teeth.

Fig. 9. *Laminella Mastersi*, Newc. Marginal teeth.

Fig. 10. Same. One central and one lateral, still more enlarged.

Fig. 11. Same. A group of central and lateral teeth. Same scale of enlargement as fig. 9.

PLATE XVI.

Fig. 1. *Helix picta*, Born. Jaw.

Fig. 2. The same, lingual membrane. *a*, central tooth.

Fig. 3. *Onchidium* (see p. 340). The central and adjacent lateral teeth of the lingual membrane, artificially separated.

Fig. 4. One separate tooth in profile.

Fig. 5. The same, a group of centrals and laterals as they occur naturally on the lingual membrane, magnified less than in figs. 3 and 4.

XXXI.—*Outlines of a Bibliography of the History of Chemistry.*

BY H. CARRINGTON BOLTON.

Read December 8, 1873.

To study a subject advantageously and satisfactorily, the first requirement is a knowledge of the literature on that subject; in this belief we have compiled a catalogue of works on the History of Chemistry, for our own use and that of those who may be interested in the origin and development of this science. So far as we know, no bibliography of the kind exists, and as the materials for such a list are widely scattered the difficulty incurred is not inconsiderable. In the following catalogue we lay no claim to completeness, but desire that it should be regarded rather as an outline to be filled up by others having greater bibliographical experience and larger facilities for research.

This bibliography is confined to independent works; the numerous essays relating to the history of specific branches of chemical science, widely disseminated throughout periodical literature, are not included; we have inserted, however, the few catalogues of chemical books, which, though not embraced by the title of this compilation, are too important adjuncts in the history of chemistry to be omitted.

Nearly all encyclopædias and dictionaries of science contain articles on chemistry from a historical point of view, under the word "alchemy;" references to these would needlessly expand this bibliography, and have been omitted. We may here mention, as noteworthy, the article on alchemy in the "Encyclopédie Méthodique," Paris, 1792; in the "Allgemeine Encyclopædie der Wissenschaft und Künste," by J. S. Ersch und J. G. Gruber, Leipzig, 1818; in Rees' "Cyclopedia, or Universal Dictionary of Arts," Edinburgh, 1819; and in the "Handwörterbuch der reinen und angewandten Chemie," of Liebig, Poggendorff and Wöhler, Braunschweig, 1857.

If undue consideration appears to be given to the history of alchemy as distinguished from chemistry proper, our readers will bear in mind that the *early* literature of chemistry is almost wholly devoted to the hermetic art. Alchemy is sometimes regarded as the dishonorable parent of a noble offspring, and has been sarcastically defined as: "Ars sine arte, cujus principium est mentiri, medium laborare, finis mendicare;"* an art without art, originating in falsehood and proceeding through labor to beggary. We agree, rather, with the British historian of chemistry, who remarks that "Alchemy, or the art of making gold, furnishes too curious a portion of the aberrations of the human intellect to be passed over in silence," and we confess to a partiality for the study of the vagaries of the gold-makers, and to finding a fascination in tracking their mysterious footsteps.

Finally, a word of apology with regard to the annotations. In order to make the bibliography instructive and somewhat more readable than such compilations usually are, we have ventured to add brief remarks in connection with the less known publications, giving some account of the author and the nature of his work. In expressing an opinion with regard to the merits of a work we disclaim any intention of assuming the position of a standard in criticism, but we believe that the opinion of an individual may be of some value, even though the views taken are diametrically opposed to the judgment of others. We have an honorable precedent, moreover, in the "Bibliotheca Bibliographica" of that learned bibliographer, Julius Petzholdt.

The works which follow are arranged in chronological order.

HOGHELANDE, THEOBALD VAN. *Historiæ aliquot transmutationis metallicæ pro defensione alchymiæ contra hortium rabiem.* 8vo. Coloniæ, 1604.

Schmieder remarks that Hoghelande was an important personage in the history of alchemy, for after experiencing serious doubts of the transmutation of metals he became a vigorous defender of the faith, and freely made his convictions known. This essay is a collection of marvellous tales concerning veritable (?) transmutations. A German translation also appeared under the title: "Beweis das die Alchymey oder Goldmacherkunst ein sonderbares Geschenk Gottes sei." 8vo. Leipzig, 1604.

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* Harris, in Rees' Cyclopedia.

Conring, Hermann. *De hermetica Ægyptiorum vetere et Paracelsica nova medicina.* 4to. Helmstadtii, 1648. (Second edition in 1669.)

Conring bitterly attacks the extreme antiquity assigned to alchemy, and provoked the reply by Borrichius, noticed below.

Borel, Pierre. [**Borellus.**] *Bibliotheca chimica, seu Catalogus Librorum Philosophicorum Hermeticorum.* Auctore Petro Borellio. Parisiis. 1654.

The first extensive catalogue of chemical books. Contains four thousand authors.

Kircher, Athanasius. *De Origine Alchymiæ;* also *De Lapide Philosophorum.* In *Mundus Subterraneus, Vol. II, Liber XI, Sectio I et II.* Folio. Amsterodami, 1665.

Athanasius Kircher, a celebrated historian, philosopher, mathematician and physical philosopher, was born at Fulda, in 1601, and died at Rome, in 1680. He filled the chairs of philosophy and oriental languages in the College of Wurtzburg and in the Jesuit's College, at Avignon. He was afterwards professor of mathematics in the Jesuit's College at Rome. Kircher was a man of "wide and varied, but ill digested erudition, and a most voluminous writer." Athough credulous to an absurd degree, in the dissertation "De Origine Alchymiæ," he violently attacks the alchemists and their pretended transmutations of the baser metals into gold. It is reprinted in Mangetus' "Bibliotheca Chemica Curiosa," where also replies to his attacks, by Clauder and by Blauenstein, are found.

Cooper, William. *A Catalogue of Chymicall Books, in 3 Parts, collected by William Cooper.* 12mo. London, 1675.

Borrichius, Olaus. *Dissertatio de ortu et progressu Chemiæ.* 4to. Hafniae, 1668. (Reprinted in the Bibl. Chem. curiosa of Mangetus, Vol. I, No. 1.)

The author of this celebrated treatise, the most frequently quoted by succeeding historians, was born at Borchen (whence his latinized name), Jutland, in 1626. He was Professor of Philosophy, Poetry, Chemistry and Botany, at the University of Copenhagen, a fact which causes Rodwell to remark that, "either Professors were difficult to procure in the Kingdom of Denmark, or else Olaus Borrichius was an astounding genius." However this may be, he was certainly a man of amazing credulity, and allowing "the imaginative faculty due to his poetical temperament, to exert an undue influence over his sober judgment," he refers the origin of alchemy to the antediluvians, endeavors to prove that Hermes Trismegistus was a real personage, the inventor of all arts, and the father of alchemy, and that the Smaragdine Table was really found by the wife of Abraham, besides accepting the preposterous theories of his contemporaries concerning the elixir of life and the philosopher's stone. This dissertation was highly prized by the alchemists of his day on account of its earnest defence of their principles.

Its present value is solely that of a curious example of the extravagant credulity of a learned man. According to Wiegleb, Borrichius' work may be accounted the first history of Chemistry (Alchemy).

MORHOF, DANIEL GEORGE. *De Transmutatione metallorum Epistola ad virum nobilissimum Joelem Langelotum.* 8vo. Hamburg, 1673. (Reprinted in Mangetus' Bibl. Chem. curiosa. Vol. I, No. 9; also appeared in German, under the title: "D. G. Morhof's Abhandlung vom Goldmachen." Baireuth, 1764.)

Morhof, born 1639, died 1691, was Professor of History at Kiel. Schmieder calls him an unprejudiced historian.

BORRICHIUS, OLAUS. *Hermetis, Ægyptiorum et chemicorum sapientia ab Herm. Conringii animadversionibus vindicata.* 4to. Hafniæ, 1674. (Reprinted in Mangetus' Bibl. Chem. curiosa, Vol. I, No. 2.)

BORRICHIUS, OLAUS. *Conspectus scriptorum chemicorum.* 4to. Hamburg, 1697. (Reprinted in Mangetus' Bibl. Chem. curiosa, Vol. I, No. 2.)

MANGET, JEAN JACQUES. [MANGETUS.] *Bibliotheca Chemica curiosa, seu rerum ad alchemiam pertinentium Thesaurus instructissimus* * * * Genevæ. 2 vols. Folio. 1702.

A collection of one hundred and thirty-three rare tracts on alchemy are here reprinted. Contains many bibliographical notes.

ROTH-SCHOLTZ, FRIEDRICH. *Bibliotheca Chemica; h. e. Collectio Auctorum fere omnium qui de naturæ arcanis, re metallica et minerali* * * *hermetice scripserunt.* * * * 5 parts. 8vo. Norimbergæ, 1725–33.

The work of a Nuremberg bookseller well versed in literature. Contains the greater part of the work of Borel, which had already become scarce. Is, however, incomplete, extending only to the letter H.

BOERHAAVE, HERMAN. *Elementa Chemiæ.* Paris, 1724. Also an English translation as follows: "A new Method of Chemistry, including the theory and practice of that art laid down on mechanical principles and accommodated to the uses of life. * * * To which is prefixed a Critical History of Chemistry and Chemists from the origin of the art to the present time. Written by the very learned H. Boerhaave. * * * Translated by P. Shaw, M.D., and E. Chambers." 4to. London, 1727.

A logically arranged, condensed history of chemistry, forming the introduction to a very remarkable work of one of the most distinguished men of the time. (Boerhaave, born 1668, died 1738.)

Du Fresnoy, Lenglet. *Histoire de la Philosophie Hermétique. Accompagné d'un Catalogue raisonné des Ecrivains de cette Science. Avec le véritable Philalethe, revu sur les originaux.* 3 vols. 12mo. Paris, 1742.

The author of this exceedingly curious work was an Abbé of some distinction as a litterateur. He was born in 1674, and died in 1755. While apparently accepting the truth of the legends relating to the great antiquity of alchemy, and narrating accounts of veritable transmutations at considerable length, he at the same time exposes the frauds practised by the adepts, and quotes entire the celebrated essay of Geoffroy: "Des Supercheries concernant la Pierre Philosophale," which rang the death knell of the Hermetic Art.

The first volume of Du Fresnoy's work contains only historical matter, concluding with a "Chronologie des plus célèbres auteurs de la philosophie hermétique." In this chronology, which begins with "Hermes, 1996 B. C.," he includes Moses, Cleopatra and Caligula, *adepts* being marked by an asterisk. The second volume continues the history, and includes the "Introitus apertus ad occlusum regis palatium" of Philalethes, entire, both in French and in Latin. The third volume consists of a compendious Bibliography of Chemistry embracing the works of a thousand authors.

Schröder, Fr. Jos. Wilh. *Geschichte der ältesten Chemie und Philosophie.* 8vo. Marburg, 1775.

Schröder was Professor of Chemistry and Medicine at the University of Marburg. This work is written in defence of the "Higher Chemistry," a term applied to alchemy by Wenzel, shortly before.

Wiegleb, J. C. *Historisch-kritische Untersuchung der Alchemie oder der eingebildeten Goldmacherkunst.* 8vo. Weimar, 1777.

A severe criticism on the claims of hermetical philosophy.

Bergman, Torbern. *De primordiis Chemiæ.* Upsala, 1779.

Bergman, Torbern. *Historiæ chemiæ medium seu obscurum ævum.* Upsala, 1782.

Bergman, born 1735, died 1784, was Professor of Chemistry at the University of Upsala. The above essays were presented to the Academy of Sciences in Stockholm.

Baumer, J. W. *Bibliotheca Chemica.* Giessen. 8vo. 1782.

Wiegleb, J. C. *Geschichte des Wachsthums und der Erfindungen in der neuern Zeit.* 2 vols. 8vo. Berlin, 1790.

This covers the period from 1650 to 1790; the matter is chronologically arranged.

Wiegleb, J. C. *Geschichte des Wachsthums und der Erfindungen in der Chemie in den ältesten und mittleren Zeiten.* 8vo. Berlin, 1792.

This is a translation of Bergman's works above mentioned.

Beckmann, Johann. *Beiträge zur Geschichte der Erfindungen.* 5 vols. 8vo. Leipzig, 1780–1805.

Gmelin, J. F. *Geschichte der Chemie seit dem Wiederaufheben der Wissenschaften bis an das Ende des* 18 *Jahrhunderts.* 3 vols. 8vo. Göttingen, 1797.

An unwieldy work, with a stupendous amount of detail, badly arranged. It excels in bibliographical references.

Reuss, J. D. *Repertorium Commentationum a Societatibus litterariis editarum secundum disciplinarum ordinem digessit J. D. Reuss.* 4to. Göttingæ, 1803. (Scientia-Naturalis. Chemia, etc. Vol. III.)

An exceedingly useful work, compiled with great diligence. Comprises sixteen volumes, of which the third volume of the division of natural science is devoted to chemistry and metallurgy. The whole work forms a proper introduction to the "Catalogue of Scientific Papers" published by the Royal Society, which covers the years 1800 to 1863.

Johnson, ————. *History of the progress of Animal Chemistry.* 3 vols. London, 1803.

Fuchs, G. Fr. Chr. *Repertorium der chemischen Litteratur von* 494 *vor Christi Geburt bis* 1806, *in chronologischer Ordnung aufgestellt.* 8vo. Jena und Leipzig, 1806–12.

This work is highly praised by Petzholdt, as exceedingly compendious and carefully prepared. It contains not only independent works, but also articles from periodical literature, to which are added numerous biographical and literary notes. Actually, it extends only to 1799, inclusive; the proposed third volume (1800 to 1806) never appeared.

Barrett, Fr. *The Lives of Alchemystical Philosophers; with a critical catalogue of books in occult chemistry and a selection of the most celebrated treatises on the theory and practice of the Hermetic Art.* 8vo. London, 1815.

Contains superficial biographies of forty-five so-called adepts, a list of seven hundred and fifty alchemical books, and selections from the most incredible treatises on the hermetic art. Bibliographically it is very inexact.

Davy, Sir Humphrey. *Historical View of the Progress of Chemistry, in Davy's Collected Works.* Vol. IV. London, 1829.

A brief sketch.

Thomson, Thomas. *A History of Chemistry.* 2 vols. 12mo. London, 1830.

A very entertaining and useful work, embracing the whole field up to the date of publication. The progress of analytical chemistry is reviewed with critical skill.

CALLISEN, A. C. P. *Medicinisches Schriftsteller Lexicon der jetzt lebenden Aerzte, Wundaerzte, Geburtshelfer, Apotheker und Naturforscher* * * 33 vols. 12mo. Kopenhagen, 1830–1845.

A wonderfully exhaustive and laborious compilation, replete with minutest details concerning the literature of medicine and natural science. Chemistry proper, though not included in the title of the work, receives its full quota of attention. The author sacrificed a fortune in compiling and publishing these numerous and closely printed volumes.

SCHMIEDER, KARL CHRISTOPH. *Geschichte der Alchemie.* 8vo. Halle, 1832.

Schmieder was born at Eisleben, in 1778, and was Director of a High School and School Inspector in Cassel, at which place he died in 1850. Several minor works on Geology and Mineralogy appeared from his pen, but none of such extraordinary character as this History of Alchemy, in which he endeavors to establish, by historic proofs, the reality of the transmutation of metals. Schmieder recognizes two distinct sciences, chemistry and alchemy, and claims they exist independently of each other from the earliest ages. Alchemy, he states, has a threefold dogma: I. It is possible to prepare, by true art, perfect gold from substances which contain no gold. II. The same is true of silver. III. This artificial preparation is a wonderful medicine, a panacea of life. Starting with this statement he investigates the authenticity of the historic records of transmutation, and sparing no pains in deciphering musty manuscripts of a former age, he concludes that we must acknowledge the reality of the transmutation of metals. He confesses that impostors abounded, but thinks he establishes the claims of five persons as true adepts, and gives their personal history with narratives of their wonderful accomplishments. He calls attention to the fact that the five persons named lived at succeeding periods and concludes that the Philosopher's Stone was secretly handed down from one to the other.

The whole aim and scope of this strange work, and especially the conclusions drawn, seem more appropriate to the times of Borrichius than to the second quarter of the enlightened 19th century.

HOEFER, FERDINAND. *Histoire de la Chimie.* 2 vols. 8vo. Paris, 1842. (Second edition in 1866.)

A work of great research, especially in regard to earliest authentic records as derived from ancient manuscripts.

KOPP, HERMANN. *Geschichte der Chemie.* 4 vols. 8vo. Braunschweig, 1843.

A classical work, above praise. Is somewhat scarce; a new edition in Roman type is desirable.

WOLFF, EMIL THEODOR. *Quellen-Literatur der theoretisch-organischen Chemie oder Verzeichniss der vom Anfang des letzten Viertheils des vorigen Jahrhunderts bis zum Schluss des Jahres* 1844 *ausgeführten chemischen Untersuchungen.* * * * 8vo. Halle, 1845.

A carefully collated index to the researches in organic chemistry within the period named.

WOLFF, EMIL THEODOR. *Vollständige Uebersicht der elementar-analytischen Untersuchungen organischer Substanzen.* * * * *Aus den chemischen Journalen* * * * *in systematischer Ordnung entworfen.* 8vo. Halle, 1846.

WAGNER, RUDOLF. *Die Geschichte der Chemie. Von der Kindheit des Menschengeschlechts bis auf unsere Tage.* 8vo. Leipzig, 1853.

FIGUIER, LOUIS. *L'Alchimie et les Alchimistes. Essai historique et critique sur la philosophie hermétique.* 12mo. Paris, 1855.

A readable work, founded mainly on Schmieder's Geschichte der Alchemie.

POPPE, ADOLPH. *Chronologische Uebersicht der Erfindungen und Entdeckungen auf dem Gebiete der Physik, Chemie, Astronomie, Mechanik und industriellen Technik von den ältesten Zeiten bis auf unsere Tage.* 8vo. Frankfurt, 1856.

ZUCHOLD, ERNST AMANDUS. *Bibliotheca Chemica. Verzeichniss der auf dem Gebiete der reinen pharmaceutischen physiologischen und technischen Chemie in den Jahren* 1840, *bis mitte* 1858 *in Deutschland und im Auslande erschienenen Schriften.* 8vo. Göttingen, 1859.

A most complete contribution to special bibliography. All the works bearing chemistry in their title, or relating to the subject, issued between the years named, in twenty-one different languages, are here alphabetically arranged. A sequel for the years 1858-70 was issued by Ruprecht in 1872.

WURTZ, ADOLPHE. *Sur quelques Points de Philosophie Chimique. Leçons professées les* 6 *et* 20 *Mars* 1863, *devant la Société Chimique* [*de Paris*] *par M. Adolphe Wurtz, Président de la Société.* 8vo. Paris, 1864.

An admirable discussion of the development and principles of modern chemical philosophy.

DEHERAIN, P. P. *Etudes pour servir à l'histoire de la Chimie* [*Extrait des Annales du Conservatoire impérial des arts et metiers*]. 8vo. Paris, 1864.

SILVESTRI, ORAZIO. *Il presente ed il passato della chimica considerata nei suoi rapporti con le altre scienze naturali.* 16mo. Catania, 1864.

Poggendorff, J. C. *Biographisch-literarisches Handwörterbuch zur Geschichte der exacten Wissenschaften, enthaltend Nachweisungen über Lebens-verhältnisse und Leistungen von Mathematikern, Astronomen, Physikern, Chemikern, Mineralögen, Geologen, u. s. w. aller Völker und Zeiten.* Lex 8vo. 2 vols. Leipzig, 1858–63.

Invaluable as a work of reference. Abounds in information concerning chemists of every age and nation.

Hoefer, Ferdinand. *La Chimie enseignée par la biographie de ses fondateurs, R. Boyle, Lavoisier, Priestley, Scheele, Davy, etc.* 12mo. Paris, 1865.

A compilation of comparatively little value.

Chevreul, E. *Histoire des Connaissances chimiques.* 8vo. Paris, 1866.

A singular work, rather metaphysical than historical or chemical.

Buff, Heinrich Ludwig. *Ein Blick auf die Geschichte der Chemie.* 8vo. Erlangen, 1866.

Kopp, Hermann. *Sonst und Jetzt in der Chemie. Ein populär-wissenschaftlicher Vortrag.* 8vo. Braunschweig, 1867.

Gerding, Th. *Geschichte der Chemie.* 8vo. Leipzig, 1867.

A rather hasty though compendious history, including notices of living chemists and modern researches.

Wurtz, Adolphe. *Histoire des Doctrines Chimiques depuis Lavoisier jusqu' à nos jours.* 12mo. Paris, 1869.

Valuable; well known for its much criticised opening sentence: "La Chimie est une Science Française."

Ladenburg, A. *Vorträge über die Entwickelungs-geschichte der Chemie in den letzten* 100 *Jahren.* 8vo. Braunschweig, 1869.

Kopp, Hermann. *Beiträge zur Geschichte der Chemie.* 8vo. Braunschweig, 1869.

Blomstrand, C. W. *Die Chemie der Jetztzeit vom Standpunkte der electro-chemischen Auffassung und aus Berzelius' Lehre entwickelt.* 8vo. Heidelberg, 1869.

Chevreul, E. *Histoire des principales opinions que l'on a eues de la nature chimique des corps, de l'espèce chimique et de l'espèce vivante.* Atlas 4to. Paris, 1869.

Kopp, Hermann. *Die Entwickelung der Chemie in der neueren Zeit.* 8vo. München, 1871–73. [In progress.]

Hoefer, Ferdinand. *Histoire de la Physique et de la Chimie depuis les temps les plus reculés jusqu' à nos jours.* 12mo. Paris, 1872.

The latter portion relating to chemistry is mainly a condensation of Hoefer's larger work noticed above.

RUPRECHT, RUDOLPH. *Bibliotheca Chemica et Pharmaceutica. Alphabetisches Verzeichniss der auf dem Gebiete der reinen, pharmaceutischen physiologischen und technischen Chemie in den Jahren,* 1858, *bis Ende* 1870, *in Deutschland und im Auslande erschienenen Schriften.* 8vo. Göttingen, 1872.

A continuation of Zuchold's Bibliotheca Chemica, similarly arranged but evidently collated with less care and completeness.

RODWELL, G. F. *The Birth of Chemistry;* in "Nature," Vols. VI and VII. 1872–73.

A popular essay full of research, especially rich in the knowledge of the Egyptians. It embraces only the period prior to 1680.

XXXII.—*Description of a new Species of Helix, and Note on H. Mobiliana,* Lea.

BY THOMAS BLAND.

Read Jan. 5, 1874.

Helix Wetherbyi, nov. sp. (*Mesodon*).

T. obtecte-perforata, orbiculato-depressa, tenuis, granulato-striata, pallide cornea; epidermide fusca, pilis prostratis, obliquis obsita, induta; spira breviter conoidea, sutura impressa, apice obtusiusculo; anfr. 5, convexiusculi, lente accrescentes, ultimus antice subito deflexus, gibbosulus, constrictus, subtus convexus, ad peripheriam subangulatus; apertura obliqua, rotundato-lunari, dente albo, erecto, obliquo, linguæformi, parietali munita; perist. labiatum, angulatim reflexum, margine supero ad insertionem expanso, columellari dilatato, adnato.

Shell with umbilicus covered, orbicular-depressed, thin, granulately striate, pale horn-colored; epidermis dark, covered with oblique, prostrate hairs; spire somewhat conoidal, suture impressed, apex obtuse; whorls five, slightly convex, gradually increasing, the last suddenly deflected, rather gibbous, constricted, beneath convex, subangulate at the periphery; aperture oblique, roundly lunate, with a white, erect, oblique, tongue-shaped parietal tooth; peristome thickened, angularly reflected, the upper margin expanded, the columella margin dilated, covering the umbilical perforation. Diam; maj. 17, min. 15 mill.; Alt. 8 mill.

Habitat. At the base of sandstone cliffs, mouth of Laurel River, Whitley Co., Kentucky. A. G. Wetherby.

Remarks.—This species belongs to the same group (Mesodon) as *H. dentifera*, Binn., and *H. Roemeri*, Pf., but is of smaller size, somewhat more elevated, and readily distinguished from them by the sculpture and epidermis. It differs from *H. divesta*, Gould, in having a parietal tooth, and, although in general appearance like a small form of *H. appressa*, Say, is without the lamina on the basal margin of the peristome.

Five specimens were collected by Mr. Wetherby, to whom I dedicate the species. I am under obligation to him for examples of this and many others, some of them rare species.

I am indebted to my friend W. G. Binney for the following particulars of the dentition of *H. Wetherbyi.*

> Jaw as usual in *Mesodon*, low, wide, arcuate, ends but little attenuated, blunt, with about eighteen decided ribs, denticulating either margin. Lingual membrane long and narrow; teeth as usual in the subgenus (see L. and F. W. Shells N. A., I, figs. 232, 242). Centrals with a long bluntly-pointed middle cusp, and obsolete side cusps; laterals like centrals, but with no inner cusps. Marginals low, wide, quadrate, with one very long, oblique, blunt, inner denticle, and one outer, short, blunt denticle.

Helix Edvardsi, Bland (*Stenotrema*).

This pretty species, hitherto solely known from Virginia, where it was discovered in 1857, by Mr. W. H. Edwards, and not found since, was collected by Mr. Wetherby, in Laurel and Whitley counties, Kentucky.

Helix Mobiliana, Lea (*Mesodon*).

In "Remarks on North American Helicidæ" (Ann. Lyc. N. Y., VI, 341, 1858), concurring in a suggestion of Dr.

Pfeiffer, I placed this species in the synonymy of *H. jejuna*, Say, having before me adult specimens from Georgia, and others, immature, from Florida. W. G. Binney (Terr. Moll., IV, 67, 1859), Tryon (Amer. Jour. Conch., II, 308, 1866), and Binney and Bland (Land and Fresh-water Shells, Part I, 151, 1869) adopted this view. Having since the latter date acquired specimens from Baldwin, Florida, collected by Col. Jewett and the late Dr. Hubbard, also from Mobile, by Mr. Mohr, I am satisfied that two species have been confounded,—that *H. Mobiliana*, Lea, is distinct from the small species, known especially from the vicinity of Savannah, Ga., now recognized as *H. jejuna*.

The figures in Terr. Moll., pl. xlii, f. 2, of Tryon (*l.c.*), pl. v, f. 3, and Land and Fresh-water Shells, fig. 258, are of *H. jejuna* and do not represent Lea's species.

In *H. Mobiliana* there are six whorls; the last whorl is remarkably constricted and gibbous at the aperture, more tumid at the base and with smaller umbilicus than in *jejuna*. The microscopic spiral lines on the embryonic whorls of the latter are absent in the former. The peristome at its junction with the penultimate whorl is sharp, not reflected nor thickened, but elsewhere reflected, thickened by a whitish callus within, the edge of which forms a distinct portion of the peristome, and has an obsolete tooth-like development near the columella. The aperture is more lunate than in *jejuna*.

H. Mobiliana may be compared, so far as regards the tumid base, small umbilicus, constricted aperture and gibbous character of the superior part of the last whorl behind the aperture, with a Texan form in my cabinet of *H. Berlandieriana*.

The measurements of my largest specimen (six whorls) of *H. Mobiliana*, from Baldwin, are as follows: Diam.; maj. 10, min. 7 mill.; alt. 6 mill.

XXXIII.—*Catalogue of the Birds ascertained to occur in Illinois.*

BY ROBERT RIDGWAY.

Read Jan. 2, 1874.

THE following catalogue of the birds of Illinois embraces only species which have been actually observed by the author within the limits of the state, and those otherwise included by reason of reliable authority for their capture, in which case the fact and reference are noted.

Though sixty-five species not previously accredited to the avi-fauna of the state, in any published catalogue or notice, are given here, the lists by Mr. Robert Kennicott, Mr. Henry Pratten and Dr. R. B. Holder, published in various numbers of the "Transactions of the Illinois State Agricultural Society," furnish a few which I could not give on my own responsibility; while for the privilege of including several species of water-fowl found about the southern end of Lake Michigan, I am indebted to Dr. J. W. Velie, of the Chicago Academy of Sciences, who has kindly furnished me much information concerning the birds of the northern portion.

The various local and general lists of the birds of Illinois, which have from time to time been published, are severally noticed and criticised at the close of this work, in an appendix specially devoted to a review of the bibliography of the ornithology of the state.

The range within the state's limits, of each species, is indicated approximately, or according to our present knowledge of their habitat. When no particular section is mentioned, it is to be understood that the distribution is general; and if any doubt exists as to the limitation of the range, or the question of the breeding, of any species, care is taken to call particular attention to it.

The asterisk before the number indicates that the species breeds within the state.

Order PASSERES.

(*Oscines.*)

Family TURDIDÆ. The Thrushes.

Subfamily Turdinæ. The true Thrushes.

Genus *Turdus*, Linnæus.

Subgenus *Hylocichla*, Baird.

*1. *T. mustelinus* Gmel. Wood Thrush; "Bell Bird." Summer sojourner; abundant.

*2. *T. fuscescens* Steph. Tawny Thrush; Wilson's Thrush. Transient in the southern portion; summer sojourner in the northern part.

3. *T. Aliciæ* Baird. Gray-cheeked Thrush. Transient.

4. *T. Swainsoni* Caban. Olive-backed Thrush; Swainson's Thrush. Transient, but possibly breeding in the northern part.

5. *T. Pallasii* Caban. Hermit Thrush; Rufous-tailed Thrush. Transient, but in mild seasons a winter sojourner south of latitude 39°. May possibly breed in the northern portion.

Subgenus *Planesticus*, Bonaparte.

*6. *T. migratorius* Linn. Robin Thrush. Common Robin. Resident.

Subfamily Miminæ. The Mocking Thrushes.

Genus *Galeoscoptes*, Cabanis.

*7. *G. Carolinensis* (Linn.). Cat Bird. Summer sojourner; sometimes wintering south of latitude 39°.

Genus *Mimus*, Boie.

*8. *M. polyglottus* (L.). Mocking Bird. "Southern Mocking Bird." Whole state, but common only in the southern and central portions. Summer sojourner, but occasionally wintering south of latitude 39°.

Genus *Harporhynchus*, Cabanis.

9. *H. rufus* (Linn.). Brown Thrasher. "Sandy Mocking Bird." Summer sojourner, but sometimes resident south of latitude 39°.

Family SAXICOLIDÆ. The Saxicolas.

Genus *Sialia*, Swainson.

10. *S. sialis* (Linn.). Blue Bird. Resident.

Family SYLVIIDÆ. The true Warblers.

Subfamily REGULINÆ. The Kinglets.

Genus *Regulus*, Cuvier.

11. *R. calendula* (Linn.). Ruby-crowned Kinglet. Transient, but sometimes wintering in the southern portion.

12. *R. satrapa* Licht. Golden-crowned Kinglet. Winter sojourner in the southern portion and transient in the northern part.

Subfamily POLIOPTILINÆ. The Gnatcatchers.

Genus *Polioptila*, Sclater.

*13. *P. cærulea* (Linn.). Blue-gray Gnatcatcher. Summer sojourner.

Family PARIDÆ.

Subfamily PARINÆ. The Chickadees or Titmice.

Genus *Lophophanes*, Kaup.

*14. *L. bicolor* (Linn.). Tufted Titmouse. Resident; excessively abundant in the southern portion.

Genus *Parus*, Linnæus.

*15. *P. atricapillus* Linn. Northern Black-capped Chickadee. Northern portion; resident.

*16. *P. Carolinensis* Aud. Carolina Chickadee; Southern Chickadee. Southern half of the state, where resident, and replacing *P. atricapillus*.

Subfamily SITTINÆ. The Nuthatches.

Genus *Sitta*, Linnæus.

*17. *S. Carolinensis* Lath. White-bellied Nuthatch; "Tom-tit." Resident.

18. *S. Canadensis* Linn. Red-bellied Nuthatch. Winter sojourner.

Family CERTHIIDÆ. The Creepers.

Genus *Certhia*, Linnæus.

*19. *C. familiaris* Linn., var. *Americana* Bonap. Brown Creeper. Resident in the northern portion, and winter sojourner (possibly summer sojourner also) in southern part.

Family TROGLODYTIDÆ. The Wrens.

Genus *Thryothorus*, Vieillot.

Subgenus *Thryothorus*.

*20. *T. Ludovicianus* (Lath.). Great Carolina Wren. Resident. Rare n the northern, but very abundant in southern and central portions.

Subgenus *Thryomanes*, Sclater.

*21. *T. Bewickii* (Aud.). Bewick's Wren; Long-tailed House Wren. Resident, and very abundant, in the southern and central portions of the state, where in many districts it entirely replaces *Troglodytes œdon.*

Genus *Troglodytes*, Vieillot.

Subgenus *Troglodytes*.

*22. *T. œdon* Vieill. House Wren; Short-tailed House Wren. Northern and central portions only? Very rare, or in some localities wanting altogether, in the southern portion. Resident?

Subgenus *Anorthura*, Rennie.

23. *T. parvulus* Koch, var. *hyemalis* Vieill. Winter Wren; "Bunty Wren." Winter sojourner.

Genus *Cistothorus*, Cabanis.

Subgenus *Cistothorus*.

*24. *C. stellaris* (Licht.). Short-billed Marsh Wren. Summer sojourner. Resident in the southern portion?

Subgenus *Telmatodytes*, Cabanis.

*25. *C. palustris* (Wils.). Long-billed Marsh Wren. Resident, at least in the southern portion.

Family MOTACILLIDÆ.

Subfamily ANTHINÆ. The Titlarks.

Genus *Anthus*, Bechstein.

26. *A. Ludovicianus* (Gmel.). American Titlark. Winter sojourner.

Family MNIOTILTIDÆ. The American Warblers.

Group MNIOTILTEÆ. The Creeping Warblers.

Genus *Mniotilta*, Vieillot.

*27. *M. varia* (Linn.). Black-and-White Creeper; Striped Creeper. Summer sojourner.

Group VERMIVORÆ. The Worm-eating Warblers.

Genus *Protonotaria*, Baird.

*28. *P. citrea* (Bodd.). Prothonotary Warbler; Golden Swamp Warbler. Abundant in the southern and central portions. Summer sojourner.

Genus *Helmitherus*, Rafinesque.

*29. *H. vermivorus* (Gm.). Worm-eating Warbler. Summer sojourner.

Genus *Helminthophaga*, Cabanis.

*30. *H. chrysoptera* (Linn.). Golden-winged Warbler. Summer sojourner in the northern and central parts, transient in the southern portion.

*31. *H. pinus* (Linn.). Blue-winged Yellow Warbler. Summer sojourner; most abundant in southern portion.

32. *H. ruficapilla* (Wils.). Nashville Warbler. Summer sojourner in the northern portion? transient in other parts.

33. *H. celata* (Say). Orange-crowned Warbler. Transient.

34. *H. peregrina* (Wils.). Tennessee Warbler. Transient.

Genus *Parula*, Bonaparte.

*35. *P. Americana* (Linn.). Blue Yellow-backed Warbler. Summer sojourner.

Group DENDROICÆ. The Wood Warblers.

Genus *Dendroica*, Gray.

Subgenus *Perissoglossa*, Baird.

36. *D. tigrina* (Gm.). Cape May Warbler. Transient.

Subgenus *Dendroica*.

*37. *D. æstiva* (Gmel.). Summer Yellow Bird; Orchard Warbler. Summer sojourner.

38. *D. coronata* (Linn.). Yellow-rumped Warbler; "Myrtle Bird." Winter sojourner in southern and central portions; transient in northern part?

39. *D. maculosa* (Gmel.). Black-and-Yellow Warbler. Transient.

*40. *D. cærulea* (Wils.). Cærulean Warbler. Summer sojourner.

41. *D. Blackburniæ* (Gmel.). Blackburnian Warbler. Transient.

*42. *D. dominica*, var. *albilora* Baird. Western Yellow-throated Warbler. Summer sojourner north to 39°, or beyond. Occasional in the northern portion of the state?

*43. *D. Pensylvanica* (Linn.). Chestnut-sided Warbler. Summer sojourner; rare in the southern, but common in central and northern portions during the breeding season; abundant everywhere in autumn.

44. *D. striata* (Linn.). Black-poll Warbler. Transient.

45. *D. castanea* (Wils.). Bay-breasted Warbler. Transient.

46. *D. cærulescens* (Forst.). Black-throated Blue Warbler. Transient.

47. *D. virens* (Gm.). Black-throated Green Warbler. Transient.

*48. *D. pinus* (Wils.). Creeping Pine Warbler. Summer sojourner; entire state?

*49. *D. discolor* (Vieill.). Prairie Warbler. Summer sojourner; entire state?

50. *D. palmarum* (Gmel.). Red-poll Warbler. Transient.

Group GEOTHLYPEÆ. The Ground Warblers.

Genus *Seiurus*, Swainson.

Subgenus *Seiurus.*

*51. *S. aurocapillus* (Linn.). Golden-crowned Thrush; "Oven Bird." Summer sojourner.

*?52. *S. Noveboracensis* (Aud.). Small-billed Water Thrush, or "Water Wagtail." Transient; sometimes winter sojourner south of latitude 39°.

*53. *S. Ludovicianus* (Gmel.). Large-billed Water Thrush, or "Water Wagtail." Summer sojourner. Entire state, but most abundant southward.

Subgenus *Oporornis*, Baird.

*54. *S. formosus* (Wils.). Kentucky Warbler. Summer sojourner. Entire state; very abundant north to 39°.

55. *S. agilis* (Wils.). Connecticut Warbler. Transient; most abundant in spring.

*56. *S. Philadelphia* (Wils.). Mourning Warbler. Summer sojourner. Breeding in extreme southern portion?

Subgenus *Geothlypis*, Cabanis.

*57. *S. trichas* (Linn.). Maryland Yellow-throat. Summer sojourner.

Group ICTERIÆ. The Chat Warblers.

Genus *Icteria*, Vieillot.

*58. *I. virens* (Linn.). Yellow-breasted Chat; "Yellow Mocking Bird." Summer sojourner.

Group SETOPHAGÆ. The Flycatching Warblers.

Genus *Myiodioctus*, Audubon.

*59. *M. mitratus* (Gmel.). Hooded Warbler. Summer sojourner.

60. *M. pusillus* (Wils.). Black-capped Green-and-Yellow Warbler. Transient.

61. *M. Canadensis* (Linn.). Canada Flycatching Warbler. Transient; breeding in northern part of State?

Genus *Setophaga*, Swainson.

*62. *S. ruticilla* (Linn.). Red-start; Black-and-Red Flycatching Warbler. Summer sojourner.

Family HIRUNDINIDÆ. The Swallows.

Genus *Progne*, Boie.

*63. *P. subis* (Linn.). Purple Martin; "House Martin." Summer sojourner.

Genus *Petrochelidon*, Cabanis.

*64. *P. lunifrons* (Say). Cliff Swallow; Eave Swallow; "Mud Swallow." Summer sojourner.

Genus *Hirundo*, Linnæus.

*65. *H. horreorum* Bartr. Barn Swallow. Summer sojourner.

Genus *Tachycineta*, Cabanis.

*66. *T. bicolor* (Vieill.). White-bellied Swallow; "Tree Swallow." Summer sojourner.

Genus *Cotyle*, Boie.

*67. *C. riparia* (Linn.). Bank Swallow; "Sand Martin." Summer sojourner.

Genus *Stelgidopteryx*, Baird.

*68. *S. serripennis* (Aud.). Rough-winged Bank Swallow; "Sand Martin." Summer sojourner. Entire state? Abundant south of 39.°

Family VIREONIDÆ. The Greenlets.

Genus *Vireo*, Vieillot.

Subgenus *Vireosylvia*, Bonaparte.

*69. *V. olivaceus* (Linn.). Red-eyed Vireo. Summer sojourner.
70. *V. Philadelphicus* Cass. Philadelphia Vireo. Transient.
*71. *V. gilvus* (Vieill.). Warbling Vireo. Summer sojourner.

Subgenus *Lanivireo*, Baird.

72. *V. solitaria* (Wils.). Blue-headed Vireo. Transient (summer sojourner northward?).

*73. *V. flavifrons* (Vieill.). Yellow-throated Vireo. Summer sojourner.

Subgenus *Vireo*, Vieillot.

*74. *V. Noveboracensis* (Gmel.). White-eyed Vireo. Summer sojourner.

*75. *V. Bellii* Aud. Bell's Vireo. Summer sojourner. Southern and central prairie districts.

Family AMPELIDÆ.

Subfamily Ampelinæ. The Wax-wings.

Genus *Ampelis*, Linnæus.

76. *A. garrulus* Linn. Northern Wax-wing. Winter visitant. Extreme northern part only?

*77. *A. cedrorum* Vieill. Southern Wax-wing; "Cedar Bird;" "Cherry Bird." Resident (not breeding in southern portion?).

Family LANIIDÆ. The Shrikes.

Genus *Collurio*, Vigors.

*78. *C. borealis* (Vieill.). Great Northern Shrike. Resident in extreme northern portion; winter visitant southwards.

*79. *C. Ludovicianus* (Linn.), var. *excubitoroides* Swains. White-rumped Shrike; Western "Logger-head;" "Butcher Bird;" "Mocking Bird." Resident.

Family TANAGRIDÆ. The Tanagers.

Genus *Pyranga*, Vieillot.

*80. *P. rubra* (Linn.). Scarlet Tanager; "Black-winged Red Bird." Summer sojourner.

*81. *P. æstiva* (Gmel.). Vermilion Tanager; "Summer Red Bird." Summer sojourner. Common in the northern portion and abundant south of 39°.

Family FRINGILLIDÆ. The Finches.

Subfamily Coccothraustinæ. The True Finches.

Genus *Coccothraustes*.

Subgenus *Hesperiphona*, Bonaparte.

82. *C. vespertinus* (Coop.). Evening Grosbeak. Winter visitant. Extreme northern portion only?

Genus *Pinicola*, Vieillot.

83. *P. enucleator* (Linn.), var. *Canadensis* Briss. Pine Grosbeak. Winter visitant. Northern portion chiefly; accidental south of 39°.

Genus *Carpodacus*, Kaup.

84. *C. purpureus* (Gmel.). Purple Finch. Winter sojourner.

Genus *Chrysomitris*, Boie.

*85. *C. tristis* (Linn.). American Goldfinch; Black-winged Yellow Bird; Lettuce Bird. Resident. Entire state (migratory in northern portion?).

86. *C. pinus* (Wils.). Pine Goldfinch; Striped Goldfinch. Irregularly migratory; chiefly transient and winter visitant.

Genus *Ægiothus*, Cabanis.

87. *Æ. linarius* (Linn.). Lesser Red-poll. Winter visitant. Chiefly northern portion; very rarely south to 39°.

88. *Æ. canescens* Gould, var. exilipes Coues. American Mealy Red-poll. Winter visitant. Extreme northern portion only (Mt. Carroll: Prof. Henry Shimer. Mus. Smiths. Inst.).

Genus *Loxia*, Linnæus.

89. *L. curvirostra* Linn., var. *Americana* Wils. Red Cross-bill; Common Cross-bill. Winter resident northwards, winter visitant southwards.

90. *L. leucoptera* Gmel. White-winged Cross-bill. Winter resident northwards, winter visitant southwards.

Genus *Plectrophanes*, Meyer.

91. *P. nivalis* (Linn.). White Snow Bird; Snow Bunting. Winter visitant. Northern and central portions only? Accidental south to 38° 20′.

92. *P. Lapponicus* (Linn.). Lapland Long-spur. Winter visitant.

93. *P. pictus* Swains. Painted Long-spur. Winter visitant. Entire state in the prairie districts.

Genus *Poocaëtes*, Baird.

*94. *P. gramineus* (Gmel.). Bay-shouldered Bunting; Grass Bunting. Summer sojourner; resident southward.

Genus *Passerculus*, Bonaparte.

*95. *P. savanna* (Wils.). Savanna Bunting. Summer sojourner; resident southward.

Genus *Ammodromus*, Swainson.

Subgenus *Coturniculus*, Bonaparte.

*96. *A. passerinus* (Wils.). Yellow-winged Bunting; "Cricket Bird." Summer sojourner.

*97. *A. Henslowi* (Aud.). Henslow's Bunting. Summer sojourner.

Genus *Chondestes*, Swainson.

*98. *C. grammaca* (Say). Lark Bunting. Summer sojourner.

Genus *Zonotrichia*, Swainson.

99. *Z. leucophrys* (Forst.). White-crowned Bunting. Winter sojourner.

100. *Z. albicollis* (Gmel.). White-throated Bunting. Winter sojourner. Entire state.

Genus *Junco*, Wagler.

101. *J. hyemalis* (Linn.). Black Snow Bird. Winter sojourner.

Genus *Spizella*, Bonaparte.

102. *S. monticola* (Gmel.). Tree Sparrow. Winter sojourner.

*103. *S. pusilla* (Wils.). Field Sparrow. Summer sojourner; resident in the southern portion.

*104. *S. pallida* (Swains.). Clay-colored Sparrow. Summer sojourner? Prairies of the northern and central portions.

*105. *S. socialis* (Wils.). Chipping Sparrow; "Chippy." Summer sojourner.

Genus *Melospiza*, Baird.

106. *M. melodia* (Wils.). Song Sparrow. Winter sojourner.

107. *M. palustris* (Wils.). Swamp Sparrow. Winter sojourner.

108. *M. Lincolnii* (Aud.). Lincoln's Sparrow. Winter sojourner in southern portion, transient northward.

Genus *Peucœa*, Audubon.

*109. *P. æstivalis* (Licht.). Bachman's Sparrow. Summer sojourner. Wabash Valley, north to 38° 30′.

Genus *Passerella*, Swainson.

110. *P. iliaca* (Merr.). Fox-colored Sparrow. Winter sojourner southward, transient northward.

Subfamily SPIZINÆ.

Genus *Euspiza*, Bonaparte.

*111. *E. Americana* (Gmel.). Black-throated Bunting; "Dick Cissel;" "Little Field Lark." Summer sojourner.

Genus *Hedymeles*, Cabanis.

*112. *H. Ludovicianus* (Linn.). Rose-breasted Grosbeak. Summer sojourner in the northern part, transient in southern portion.

Genus *Guiraca*, Swainson.

*113. *G. cærulea* (Linn.). Blue Grosbeak. Summer sojourner. North to 38° 30′. Rare.

Genus *Cyanospiza*, Baird.

*114. *C. cyanea* (Linn.). Indigo Bird; "Green Linnet." Summer sojourner.

115. *C. ciris* (Linn.). Painted Bunting; Nonpareil. Summer visitant to southern portion. (One specimen near Mt. Carmel, June, 1871.)

Genus *Cardinalis*, Bonaparte.

*116. *C. Virginianus* (Briss.). Cardinal Grosbeak; Crested Red Bird; "Corn-cracker." Resident. Entire state, but rare in the northern portion.

Genus *Pipilo*, Vieillot.

*117. *P. erythrophthalmus* (Linn.). Chewink; Charee; Ground Robin; Swamp Robin. Resident.

Family ALAUDIDÆ. The Larks.

Genus *Eremophila*, Boie.

*118. *E. alpestris* (Linn.). "Snow Lark;" Horned Lark. Resident. Entire state, but most abundant on the prairies, and merely winter resident in the heavily wooded districts.

Family ICTERIDÆ.

Subfamily AGELAINÆ.

Genus *Dolichonyx*, Swainson.

*119. *D. oryzivorus* (Linn.). Bob-o-link; "Skunk Blackbird," etc. Transient in southern portion, summer sojourner in northern part.

Genus *Molothrus*, Swainson.

*120. *M. pecoris* (Gmel.). Cow Blackbird; "Clod-hopper." Resident in southern portion; summer sojourner northward.

Genus *Xanthocephalus*, Bonaparte.

*121. *X. icterocephalus* (Bonap.). Yellow-headed Blackbird. Summer sojourner in northern portion, resident in southern districts (?). Prairies of entire state, but commonest northwards.

Genus *Agelaius*, Vieillot.

*122. *A. phœniceus* (Linn.). Red-winged Blackbird; Swamp Blackbird. Resident in southern portion, summer sojourner northwards.

Genus *Sturnella*, Vieillot.

*123. *S. magna* (Linn.). Meadow Lark; "Field Lark." Resident.

*124. *S. neglecta* Aud. Western Meadow Lark. Resident. Prairies only, chiefly along the western side of the state, but found as far east as Richland and Jasper counties.

Subfamily Icterinæ. The Hang-nests.

Genus *Icterus*.

*125. *I. Baltimore* (Linn.). Baltimore Oriole; Fire-bird; Golden Robin; Hang-nest; Hanging Bird, etc. Summer sojourner.

*126. *I. spurius* (Linn.). Orchard Oriole. Summer sojourner.

Subfamily Quiscalinæ. The Crow Blackbirds.

Genus *Scolecophagus*, Swainson.

127. *S. ferrugineus* (Gmel.). Rusty Blackbird. Winter sojourner.

128. *S. cyanocephalus* (Wagl.). Brewer's Blackbird. Winter visitant. (Mt. Carmel, December, 1866.)

Genus *Quiscalus*, Vieillot.

*129. *Q. versicolor*, var. *æneus* Ridgway. Bronzed Grackle; Western Crow Blackbird. Resident in southern portion, summer sojourner in northern part.

Family CORVIDÆ.

Subfamily Corvinæ. The Ravens and Crows.

Genus *Corvus*, Linnæus.

*130. *C. corax* Linn., var. *carnivorus* Bartr. Raven. Resident. Entire state (?), in wild, heavily timbered localities.

*131. *C. Americanus* Aud. Common Crow. Resident.

Subfamily Garrulinæ. The Jays.

Genus *Pica*, Cuvier.

132. *P. caudata* Linn., var. *Hudsonica* Sabine. Magpie. Winter visitant. Northern portion only.

Genus *Cyanura*, Swainson.

*133. *C. cristata* (Linn.). Blue Jay. Resident.

(*Clamatores.*)

Family TYRANNIDÆ. The Tyrant Flycatchers.

Subfamily Tyranninæ.

Genus *Tyrannus*, Cuvier.

*134. *T. Carolinensis* (Linn.). King Bird; Bee Bird; Bee Martin. Summer sojourner.

Genus *Myiarchus*, Cabanis.

*135. *M. crinitus* (Linn.). Great Crested Flycatcher. Summer sojourner.

Genus *Sayornis*, Bonaparte.

*136. *S. fuscus* (Gmel.). Pewee; Phœbe Bird. Resident south of 39°; summer sojourner northwards.

Genus *Contopus*, Cabanis.

137. *C. borealis* Swains. Olive-sided Wood Pewee; Great Wood Pewee. Transient in northern portion. Whole state?

*138. *C. virens* (Linn.). Wood Pewee. Summer sojourner.

Genus *Empidonax*, Cabanis.

*139. *E. pusillus* (Swains.), var. *Traillii* Aud. Traill's Flycatcher. Summer sojourner. Whole state.

140. *E. minimus* Baird. Least Flycatcher. Summer sojourner in northern portion? Transient southwards.

*141. *E. acadicus* (Gmel.). Acadian Flycatcher. Summer sojourner. Entire state? (Most abundant species in southern portion.)

142. *E. flaviventris* Baird. Yellow-bellied Flycatcher. Transient.

Order PICARIÆ.

(*Cypseli.*)

Family ALCEDINIDÆ. The Kingfishers.

Genus *Ceryle*, Boie.

*143. *C. alcyon* (Linn.). Belted Kingfisher. Resident in southern portion, summer sojourner in northern part.

Family CAPRIMULGIDÆ. The Goatsuckers.

Subfamily CAPRIMULGINÆ.

Genus *Caprimulgus*, Linnæus.

*144. *C. vociferus* Wils. Whip-poor-will. Summer sojourner.

*145. *C. Carolinensis* Gmel. Chuck-will's-widow. Summer sojourner north to 38° 20′. Rare?

Genus *Chordeiles*, Swainson.

*146. *C. popetue* (Vieill.). Night Hawk; Bull Bat. Summer sojourner.

Family CYPSELIDÆ. The Swifts.

Subfamily CHÆTURINÆ.

Genus *Chætura*, Stephens.

*147. *C. pelagica* (Linn.). Chimney Swallow; Chimney Swift. Summer sojourner.

Family TROCHILIDÆ. The Humming Birds.

Subfamily TROCHILINÆ.

Genus *Trochilus*, Linnæus.

*148. *T. colubris* Linn. Ruby-throated Hummer. Summer sojourner.

(*Cuculi.*)

Family CUCULIDÆ. The Cuckoos.

Subfamily COCCYGINÆ.

Genus *Coccygus*, Vieillot.

*149. *C. Americanus* (Linn.). Yellow-billed Cuckoo; "Rain Crow;" "Wood Pigeon." Summer sojourner.

*150. *C. erythrophthalmus* (Wils.). Black-billed Cuckoo; Red-eyed Cuckoo. Summer sojourner.

(*Pici.*)

Family PICIDÆ. The Woodpeckers.

Subfamily PICINÆ.

Genus *Campephilus*, Gray.

*151. *C. principalis* (Linn.). Ivory-billed Woodpecker; "Big Log Cock." Resident. Ohio, lower Mississippi (?) and lower Wabash bottoms only.

Genus *Picus*, Linnæus.

*152. *P. villosus* Linn. Hairy Woodpecker; "Big Sapsucker." Var. *villosus*, Linn., resident. Var. *Auduboni*, summer sojourner (resident?) in southern portion.

*153. *P. pubescens* L. Downy Woodpecker; "Little Sapsucker" "Guinea Woodpecker." Resident.

Genus *Picoides*, Lacépede.

154. *P. arcticus* (Swains.). Black-backed Three-toed Woodpecker. Winter visitant to northern portion. (VELIE.).

Genus *Sphyropicus*, Baird.

*155. *S. varius* (Linn.). Yellow-bellied Woodpecker; Red-throated Woodpecker. Winter sojourner in southern portion; resident in northern part?

Genus *Dryocopus* Boie.

Subgenus *Hylotomus*, Baird.

*156. *D. pileatus* (Linn.). Pileated Woodpecker; "Black Woodcock;" "Log cock." Resident.

Genus *Melanerpes*, Swainson.

Subgenus *Centurus*, Swainson.

*157. *M. Carolinus* (Linn.). Red-bellied Woodpecker; "Checkered Woodpecker;" "Woodchuck." Resident.

Subgenus *Melanerpes*.

*158. *M. erythrocephalus* (Linn.). Red-headed Woodpecker. Resident.

Genus *Colaptes*, Swainson.

*159. *C. auratus* (Linn.). Golden-winged Woodpecker; "Yellow Hammer;" Yellow-shafted Flicker; "Flicker;" "High-holder;" "Wake-up," etc. Resident.

Order PSITTACI. The Parrots.

Family PSITTACIDÆ.

Genus *Conurus*, Kuhl.

*160. *C. Carolinensis* (Briss.). Parakeet; Carolina Parrot. Resident. Formerly abundant throughout the state, but now confined to the heavy forests of the bottoms of the southern rivers.

Order RAPTORES. Birds of Prey.

Family STRIGIDÆ. The Owls.

Subfamily STRIGINÆ.

Genus *Strix*, Savigny.

*161. *S. flammea* Linn., var. *pratincola* Bonap. Barn Owl.

Subfamily BUBONINÆ.

Genus *Otus*, Cuvier.

Subgenus *Otus*.

*162. *O. vulgaris* (Flem.), var. *Wilsonianus* Bonap. Long-eared Owl; Lesser Horned Owl. Resident.

Subgenus *Brachyotus*, Gould.

*163. *O. brachyotus*. Short-eared Owl. Resident.

Genus *Nyctale*, Brehm.

*164. *N. acadica* (Gmel.). Saw-whet Owl; White-fronted Owl; Kirtland's Owl. Winter visitant to southern portion; resident in extreme northern portions?

Genus *Syrnium*, Savigny.

Subgenus *Syrnium.*

*165. *S. nebulosum* (Forst.). Barred Owl; "Hoot Owl." Resident.

Subgenus *Scotiaptex*, Swains.

166. *S. cinereum* (Gmel.). Great Gray Owl. Winter visitant to extreme northern portions.

Genus *Scops*, Savigny.

*167. *S. asio* (L.). "Screech Owl;" Little Red Owl; Mottled Owl. Resident.

Genus *Bubo*, Duméril.

Subgenus *Bubo.*

*168. *B. Virginianus* (Gmel.). Great Horned Owl; "Cat Owl." *a.* var. *Virginianus* Gmel. Resident. *b.* var. *arcticus* Swains. Winter visitant to northern portion (Pekin, CAMBRIDGE MUSEUM).

Subgenus *Nyctea*, Stephens.

169. *B. scandiaca* (Linn.), var. *arctica* Bartr. Snowy Owl. Winter visitant. Entire state.

Genus *Surnia*, Duméril.

170. *S. ulula* (Linn.), var. *Hudsonia* Gmel. Hawk Owl. Winter visitant to northern portion (KENNICOTT).

Family FALCONIDÆ. The Hawks.

Subfamily FALCONINÆ. The Falcons.

(*Falcones.*)

Genus *Falco*, Auctorum.

171. *F. communis* Gmel., var. *anatum* Bonap. American Peregrine Falcon; Duck Hawk. Resident?

Subgenus *Hierofalco*, Cuvier.

172. *F. lanarius* Gmel., var. *polyagrus* Cass. Autumnal and winter visitant. (Rock Island, SARGENT; Mt. Carmel and Bridgeport, RIDGWAY.)

Subgenus *Æsalon*, Kaup.

*173. *F. columbarius* Linn. American Merlin; Pigeon Hawk. Resident?

Subgenus *Tinnunculus*, Vieillot.

*174. *F. sparverius* (Linn.). American Kestril; Sparrow Hawk. Resident.

Subfamily BUTEONINÆ. The True Hawks, Eagles, Kites, etc.

(*Pandiones.*)

Genus *Pandion*, Savigny.

*175. *P. haliætus* Linn., var. *Carolinensis* Gmel. Fish Hawk; American Osprey. Resident.

(*Pernes.*)

Genus *Nauclerus*, Vigors.

*176. *N. forficatus* (Linn.). Swallow-tailed Kite; "Snake Hawk;" "Fish-tail Hawk." Summer sojourner.

(*Elani.*)

Genus *Elanus*, Savigny.

177. *E. leucurus* Vieill. Black-shouldered Kite; White-tailed Kite. Summer visitant north to 38° 30′. (Mt. Carmel, July, 1865; RIDGWAY.)

(*Ictiniæ.*)

Genus *Ictinia*, Vieillot.

*178. *I. Mississippiensis* (Wils.). Mississippi Kite; Blue Kite; "Square-tailed Kite." Summer sojourner. Abundant on prairies of southern and central portions. Whole state?

(*Circi.*)

Genus *Circus*, Lacépede.

*179. *C. cyaneus* (Linn.), var. *Hudsonius* Linn. Marsh Hawk; American Harrier. Resident.

(*Nisi.*)

Genus *Nisus*, Cuvier.

Subgenus *Nisus*.

*180. *N. fuscus* (Gmel.). Sharp-shinned Hawk. Resident.

*181. *N. Cooperi* (Bonap.). Cooper's Hawk; "Swift Hawk;" "Quail Hawk." Resident.

Subgenus *Astur*, Lacépede.

182. *N. palumbarius* Linn., var. *atricapillus* Wils. American Goshawk. Winter visitant. Whole state?

(*Buteones.*)

Genus *Buteo*, Cuvier

Subgenus *Asturina*, Vieil

183. *B. nitida* (Lath.), var. *plagiata* Lic
Summer visitant to southern portion. (Fox prai
1871, one specimen; Ridgway.)

Subgenus *Buteo*, Cuvie

*184. *B. lineatus* (Gmel.). Red-shouldere

185. *B. Pensylvanicus* (Wils.). Broad-w
Breeding in northern part?

*186. *B. borealis* (Gmel.). Red-tailed Ha
Hawk." Resident.

Subgenus *Tachytriorchis*,

187. *B. Swainsoni* Bonap. Swainson's
Breeding in northern portion?

(*Archibuteones.*)

Genus *Archibuteo*, Bre

188. *A. lagopus* (Brünn.), var. *sancti-jo*
Rough-legged Hawk; Black Hawk. Winter soj

(*Aquilæ.*)

Genus *Aquila*, Auctor

189. *A. chrysætus* Linn., var. *Canadensis*
Eagle; Ring-tailed Eagle; Mountain Eagle. W

(*Haliaëti.*)

Genus *Haliaëtus*, Savi

*190. *H. leucocephalus* (Briss.). Bald E
Eagle. Resident.

Family CATHARTIDÆ. The An

Genus *Rhinogryphus*, Rid

*191. *R. aura* (Linn.). Turkey Buzzard.
summer sojourner in northern portions.

Genus *Catharista*, Viei

192. *C. atrata* (Bartr.). Carrion Crow;
visitant to southern portion.

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* Type *Vulture aura* Linn. Includes also *Cathar*

Order COLUMBÆ.

Family COLUMBIDÆ. The Pigeons or Doves.

Genus *Ectopistes*, Swainson.

***193.** *E. migratoria* (Linn.). Wild Pigeon; Passenger Pigeon. Resident southward, summer sojourner northward.

Genus *Zenaidura*, Bonaparte.

***194.** *Z. Carolinensis* (Linn.). Turtle Dove; Mourning Dove. Resident north to 39°. Summer sojourner northwards.

Order GALLINÆ.

Family PHASIANIDÆ. The Pheasants.

Subfamily MELEAGRINÆ. The Turkeys.

Genus *Meleagris*, Linnæus.

***195.** *M. gallopavo* Linn., var. *sylvestris* Bartr. Wild Turkey. Resident.

Family TETRAONIDÆ. The Grouse.

Genus *Bonasa*, Stephens.

***196.** *B. umbellus* (Linn.). Ruffed Grouse; Drumming Grouse. "Pheasant." Resident. Entire state.

Genus *Cupidonia*, Reichenbach.

***197.** *C. cupido* (Linn.). Pinnated Grouse; "Prairie Chicken." Resident.

Genus *Pediocaëtes*, Baird.

***198.** *P. phasianellus* (Linn.), var. *Columbianus* Ord. Sharp-tailed Grouse. Resident? Northern prairies only.

Genus *Lagopus*, Vieillot.

199. *L. albus* (Gm.). White Ptarmigan; Willow Grouse. Winter visitant to extreme northern portion (Cook Co., KENNICOTT).

Family PERDICIDÆ. The Quails and Partridges.

Subfamily ORTYGINÆ. The American Quails.

***200.** *O. Virginianus* (Linn.). Virginia Quail, or Partridge; Bob-white. Resident.

Order LIMICOLÆ.

Family CHARADRIDÆ. The Plovers.

Genus *Charadrius*, Linnæus.

Subgenus *Charadrius.*

201. *C. pluvialis* (L.), var. *Virginicus* Borck. Golden Plover.

Subgenus *Squatarola*, Cuvier.

202. *C. helveticus* (Linn.). Black-bellied Plover. Transient.

Genus *Ægialitis*, Boie.

Subgenus *Oxyechus*, Reichenbach.

*203. *Æ. vociferus* (Linn.). Kill-deer Plover. Resident — at least in southern portion.

Subgenus *Ægialitis.*

204. *Æ. hiatacula* (L.), var. *semipalmatus* Bonap. Ring-necked Plover; Semipalmated Plover. Transient.

205. *Æ. melodus* (Ord). Piping Plover. Transient.

Family HÆMATOPODIDÆ. The Oyster-catchers.

Genus *Strepsilas*, Illiger.

206. *S. interpres* (Linn.). Turn-stone. Shore of Lake Michigan.

Family SCOLOPACIDÆ. The Snipes.

(*Scolopaci.*)

Genus *Philohela*, Gray.

*207. *P. minor* (Gmel.). American Wood-cock. Resident.

Genus *Gallinago*, Leach.

*208. *G. gallinaria* (Gmel.), var. *Wilsonii* Temm. Common Snipe; Gutter Snipe; English Snipe. Resident in northern portions; winter resident southward.

Genus *Macrorhamphus*, Leach.

209. *M. griseus* (Gmel.). Red-breasted Snipe; Gray Snipe. Transient.

(*Tringæ.*)

Genus *Micropalama*, Baird.

210. *M. himantopus* Bonap. Stilt Sandpiper. Transient.

Genus *Ereunetes*, Illiger.

211. *E. pusilla* Linn. Semipalmated Sandpiper. Transient.

Genus *Tringa*, Linnæus.

Subgenus *Actodromus*, Kaup.

212. *T. Bonapartei* Schleg. Bonaparte's Sandpiper. Transient.
213. *T. maculata* Vieill. Transient.
214. *T. Bairdii* Coues. Baird's Sandpiper. Transient.
*215. *T. minutilla* Vieill. Least Sandpiper. Summer sojourner. Found in spring, summer and autumn, about the prairie ponds throughout the state.

Subgenus *Pelidna*, Cuvier.

216. *T. alpina*, var. *Americana* Cass. Red-backed Sandpiper. Transient.

Subgenus *Arquatella*, Baird.

217. *T. maritima* (Brünn.). Purple Sandpiper. Shore of Lake Michigan.

Subgenus *Tringa*.

218. *T. canuta* (Linn.). Robin Snipe. Shore of Lake Michigan.

Genus *Calidris*, Cuvier.

219. *C. arenaria* Linn. Sanderling. Transient.

(*Totaneæ.*)

Genus *Symphemia*, Rafinesque.

*220. *S. semipalmata* Gmel. Willet. Summer sojourner.

Genus *Totanus*, Bechstein.

Subgenus *Rhyacophilus*, Kaup.

221. *T. melanoleucus* Gmel. Tell-tale; Big Yellow-legs. Transient.
222. *T. flavipes* Gmel. Yellow-legs. Transient.
*223. *T. chloropus* (Linn.), var. *solitarius* Wils. Solitary Sandpiper; Wood Sandpiper; Peet-weet; Tilt-up. Summer sojourner.

Genus *Tringoides*, Bonaparte.

*224. *T. hypoleucus* (Linn.), var. *macularius* Linn. Spotted Sandpiper; "Sand Lark;" "Sand Peet-weet.

Genus *Actiturus*, Bonaparte.

*225. *A. Bartramius* (Wils.). Prairie "Plover;" Field "Plover;" Upland "Plover." Summer sojourner.

Genus *Tryngites*, Cabanis.

226. *T. rufescens* (Vieill.). Buff-breasted Sandpiper. Transient.

(*Limosæ.*)

Genus *Limosa*, Brisson.

227. *L. fedoa* (Linn.). Marbled Godwit. Transient.

228. *L. Hudsonica* (Lath.). Hudsonian Godwit; Bay-breasted Godwit. Transient.

(*Numeneæ.*)

Genus *Numenius*, Linnæus.

*229. *N. longirostris* Wils. Long billed Curlew. Resident, but disappearing in severe weather; perhaps not breeding in southern portion.

230. *N. Hudsonicus* Lath. Hudsonian Curlew. Transient.

231. *N. borealis* (Forst.). Eskimo Curlew. Transient.

Family PHALAROPODIDÆ. The Phalaropes.

Genus *Lobipes*, Cuvier.

Subgenus *Lobipes.*

232. *L. hyperboreus* (Linn.). Northern Phalarope.

Subgenus *Steganopus*, Vieillot.

*233. *L. Wilsonii* Sab. Wilson's Phalarope.

Genus *Phalaropus*, Brisson.

234. *P. fulicarius* (Linn.). Red-bellied Phalarope.

Family RECURVIROSTRIDÆ. The Avocets and Stilts.

Genus *Recurvirostra*, Linnæus.

235. *R. Americana* Gmel. Avocet; Scooper.

Genus *Himantopus*, Brisson.

236. *H. nigricollis* Vieill. Stilt.

Order HERODIONES.

Family CICONIIDÆ. The Storks.

Genus *Tantalus*, Linnæus.

237. *T. loculator* Linn. Wood Ibis. Summer visitant, frequenting chiefly the lagoons of the bottom lands, in the southern portions.

Family IBIDIDÆ.

Subfamily IBIDINÆ. The Ibises.

Genus *Ibis*, Mœhring.

Subgenus *Falcinellus*, Bechstein.

238. *I. falcinellus* (Linn.). Glossy Ibis; "Black Curlew."

Family ARDEIDÆ. The Herons.

(*Ardeæ.*)

Genus *Ardea*, Linnæus.

*239. *A. herodias* Linn. Great Blue Heron; Blue "Crane." Summer sojourner.

Genus *Herodias*, Boie.

*240. *H. alba* (Linn.), var. *egretta* (Gmel.). White Heron; American Egret; White "Crane." Summer sojourner in the southern portions; autumnal visitant to northern part of the state.

Genus *Garzetta*, Kaup.

Subgenus *Garzetta.*

*241. *G. candidissima* (Jacq.). Snowy Heron; Little White Heron. Summer sojourner.

Subgenus *Florida*, Baird.

242. *G. cærulea* (Linn.). Little Blue Heron. Summer visitant to southern portions.

Genus *Butorides*, Blasius.

*243. *B. virescens* (Linn.). Green Heron; "Fly-up-the-creek;" "Schytepoke." Summer sojourner.

Genus *Nyctiardea*, Swainson.

*244. *N. grisea* (Linn.), var. (?) "*gardeni* Gmel." Black-crowned Night Heron; "Qua Bird." Summer sojourner.

Genus *Nyctherodias*, Reichenbach.

245. *N. violaceus* (Linn.). Yellow-crowned Night Heron. Summer visitant to extreme southern portions.

(*Botaureæ.*)

Genus *Ardetta*, Gray.

*246. *A. exilis* (Gmel.). Least Bittern. Summer sojourner.

Genus *Botaurus*, Stephens.

*247. *B. lentiginosus* Steph. American Bittern; Stake-driver. Resident in southern portions, summer sojourner northward.

Order ALECTORIDES.

Family GRUIDÆ. The Cranes.

Genus *Grus*, Linnæus.

*248. *G. Americanus* Linn. Whooping Crane; White Crane. Summer sojourner.

*249. *G. Canadensis* Linn. Sand-hill Crane; Brown Crane. Resident southward.

Family RALLIDÆ.

Subfamily RALLINÆ. The Rails.

Genus *Rallus*, Bechstein.

*250. *R. elegans* Aud. Red-breasted Rail; Marsh Hen. Summer sojourner; sometimes resident in southern portions.

*251. *R. Virginianus* Linn. Virginia Rail; Little Red-breasted Rail. Resident, except in northern portions.

Genus *Porzana*, Vieillot.

*252. *P. Carolina* Vieill. Common Rail; Sora. Resident in southern portions, and summer sojourner northward.

*253. *P. Noveboracensis* (Gmel.). Little Yellow Rail. Resident? Breeds throughout the state.

*254. *P. Jamaicensis* (Gmel.). Little Black Rail. Summer sojourner in southern portions.

Subfamily GALLINULINÆ. The Gallinules.

Genus *Gallinula*, Brisson.

Subgenus *Gallinula*.

*255. *G. chloropus* (Linn.), var. *galeata* Licht. Florida Gallinule; "Red-billed Mud Hen." Summer sojourner.

Subgenus *Porphyrio*, Brisson.

256. *G. martinica* (Linn.) Purple Gallinule; "Blue Peter." Summer visitant in southern portions (Wabash Valley).

Subfamily FULICINÆ. The Coots.

Genus *Fulica*, Linnæus.

*257. *F. Americana* Gmel. Coot; "White-billed Mud Hen." Summer sojourner.

Order LAMELLIROSTRES.

Family ANATIDÆ.

Subfamily CYGNINÆ. The Swans.

Genus *Cygnus*, Linnæus.

Subgenus *Olor*, Wagler.

258. *C. buccinator* Rich. Trumpeter Swan. Transient; sometimes winter resident.

259. *C. Americanus* Sharpless. Common Swan. Transient; sometimes winter resident.

Subfamily ANSERINÆ. The Geese.

Genus *Anser*, Brisson.

Subgenus *Chen*, Boie.

260. *A. hyperboreus* Pall. *a.* var. *hyperboreus* Pall. Snow Goose. *b.* var. *albatus* Cass. "White Brant." Winter sojourner; the var. *albatus* more common than the larger race.

261. *A. cærulescens* Linn. White-headed Goose. Transient; sometimes winter sojourner.

Subgenus *Anser*, Brisson.

262. *A. albifrons* Bechst., var. *Gambeli* Hartl. White-fronted Goose. Transient; sometimes winter sojourner.

Subgenus *Branta*, Scopoli.

263. *A. Canadensis* (Linn.). *a.* var. *Canadensis* Linn. Big Wild Goose. *b.* var. *Hutchinsii* Rich. Little Wild Goose. Transient; sometimes winter sojourner. The var. *Hutchinsii* the more common form.

264. *A. bernicla* Linn. Brant. Transient; sometimes winter sojourner.

Subfamily ANATINÆ. The Ducks.

Genus *Anas*, Linnæus.

Subgenus *Anas*.

*265. *A. boschas* Linn. Mallard; "Green-head." Resident, but most numerous in spring and autumn. In the southern portion confined to the prairies in the breeding season.

*266. *A. obscura* Gmel. Dusky Duck. Resident, but breeding very sparingly on the prairies, and wintering in the lagoons of the densely wooded bottoms.

Subgenus *Chaulelasmus*, Gray.

*267. *A. streperus* (Linn.). Gadwall; Gray Duck. Transient; perhaps breeding in the northern, and occasionally wintering in the southern, portion of the state.

Subgenus *Mareca*, Stephens.

268. *A. penelope* (Linn.). European Widgeon. Accidental in the northern part (Chicago, D. G. Elliot, P. Z. S.—)

269. *A. Americana* (Gmel.). American Widgeon; "Bald-pate." Transient, or winter sojourner southward.

Subgenus *Dafila*, Leach.

270. *A. acuta* (Linn.). Pin-tail; Sprig-tail. Transient, or occasional winter sojourner in southern portion.

Subgenus *Nettion*, Kaup.

*271. *A. Carolinensis* (Gmel.). Green-winged Teal. Resident, but most abundant during migrations: breeds only in the prairie districts, and winters chiefly in the lagoons of the heavily timbered bottoms.

Subgenus *Querquedula*, Stephens.

*272. *A. discors* (Linn.). Blue-winged Teal. Resident. Breeds sparingly in the prairie districts, and winters in small numbers in the ponds of the bottoms.

Subgenus *Spatula*, Boie.

*273. *A. clypeata* (Linn.). Shoveller; Spoon-bill. Summer sojourner in the northern portions; transient, or winter sojourner southward.

Genus *Aix*, Boie.

*274. *A. sponsa* (Linn.). Summer Duck; Wood Duck; Tree Duck. Summer sojourner in northern portion, and resident in southern part.

Genus *Fuligula*, Stephens.

Subgenus *Fulix*, Sundevall.

275. *F. marila* (Linn.). *a.* var. *marila* Linn. Scaup; Broad-bill; Blue-bill. *b.* var. *affinis* Forst. Little Scaup, etc. Winter sojourner.

276. *F. collaris* Donov. Ring-neck Scaup; Ring-bill. Winter sojourner.

Subgenus *Aythya*, Boie.

277. *F. Americana* Eyton. Red-head; American Pochard. Winter sojourner.

278. *F. vallisneria* Wils. Canvas-back. Winter sojourner.

Genus *Bucephala*, Baird.

279. *B. clangula* (Linn.), var. *Americana* Bonap. Winter sojourner.

280. *B. albeola* (Linn.). Butter-ball; Buffle-head; "Di Dipper." Winter sojourner.

Genus *Histrionicus*, Lesson.

281. *H. torquatus* (Linn.). Harlequin Duck. Winter visitant to Lake Michigan (Dr. Velie).

Genus *Harelda*, Leach.

282. *H. glacialis* (Linn.). Long-tail; "Old Squaw." Winter visitant to Lake Michigan (Dr Velie).

Genus *Melanetta*, Boie.

283. *M. velvetina* (Cass.). Velvet Duck. Winter visitant to Lake Michigan (Dr. Velie).

Genus *Œdemia*, Fleming.

284. *Œ. nigra* (Linn.), var. *Americana* Swains. Black Scoter. Winter visitant to Lake Michigan (Dr. Velie).

Genus *Erismatura*, Bonaparte.

*285. *E. rubida* (Wils.). Ruddy Duck; Spine-tailed Duck. Resident.

Genus *Mergus*, Linnæus.

Subgenus *Mergus*.

286. *M. merganser* Linn., var. *Americanus* Cass. Buff-breasted Sheldrake. Winter sojourner.

287. *M. serrator* Linn. Red-breasted Sheldrake. Winter sojourner.

Subgenus *Lophodytes*, Reichenbach.

*288. *M. cucullatus* Linn. Hooded Sheldrake. Resident.

Order STEGANOPODES.

Family PELECANIDÆ. The Pelicans.

Genus Pelecanus, Linnæus.

289. *P. erythrorhynchus* Gmel. American White Pelican. Transient.

Family GRACULIDÆ. The Cormorants.

Genus *Graculus*, Linnæus.

*290. *G. dilophus* Swains. *a.* var. *dilophus* Swains. Double-crested Cormorant. *b.* var. *Floridanus* Aud. Florida Cormorant. The var. *dilophus* winter sojourner; var. *Floridanus* summer visitant, probably breeding.

Family PLOTEIDÆ. The Anhingas.

Genus *Plotus*, Linnæus.

291. *P. anhinga* Linn. Snake-bird; Darter. Summer sojourner in extreme southern portion; rare summer visitant north to 38° 30′.

Order LONGIPENNES.

Family LARIDÆ.

Subfamily Larinæ. The Gulls.

Genus *Larus*, Linnæus.

Subgenus *Larus*.

292. *L. marinus* Linn. Black-backed Gull. "Saddle Back." Winter visitant on Lake Michigan (Dr. Velie).

293. *L. argentatus* Brünn., var. *Smithsonianus* Coues. Herring Gull. Winter sojourner; occasional in summer?

294. *L. Delawarensis* Ord. Ring-billed Gull. Winter sojourner.

Subgenus *Chroicocephalus*, Eyton.

295. *C. Philadelphia* (Ord). Bonaparte's Gull; Little Black-headed Gull.

296. *C. Franklinii* (Rich.). Franklin's Rosy-breasted Gull. Winter visitant to northern portions.

297. *C. atricilla* (Linn.) Laughing Gull. Summer visitant.

Subfamily Sterninæ. The Terns.

Genus *Sterna*, Linnæus.

Subgenus *Thalasseus*, Boie.

298. *S. caspia* Pall., var. *imperator* Coues. Caspian Tern. Winter visitant to northern part.

299. *S. regia* Gamb. Royal Tern; Cayenne Tern. Summer visitant throughout the state.

Subgenus *Gelochelidon*.

300. *S. anglica* Mont. (var. "*aranea* Wils."). Marsh Tern. Summer visitant to Lake Michigan.

Subgenus *Sterna*, Linnæus.

*301. *S. hirundo* Linn. Common Tern; Wilson's Tern. Summer sojourner in northern portion.

*302. *S. Forsteri* Nutt. Forster's Tern. Summer sojourner.

*303. *S. antillarum* (Less.). Summer sojourner.

Subgenus *Hydrochelidon*, Boie.

*304. *S. fissipes* Linn. Black Tern; Short-tailed Tern. Summer sojourner.

Order PYGOPODES.

Family COLYMBIDÆ. The Loons.

Genus *Colymbus*, Linnæus.

305. *C. glacialis* Linn., var. *torquatus* Brünn. Great Northern Diver; Loon. Winter sojourner.

306. *C. arcticus* Linn. Black-throated Loon. Winter sojourner.

307. *C. septentrionalis* Linn. Red-throated Loon. Winter sojourner.

Family PODICIPIDÆ. The Grebes.

Genus *Podiceps*, Latham.

308. *P. griseigena* (Bodd.), var. *holbolli* Reinh. Red-necked Grebe. Winter sojourner.

*309. *P. cristatus* Linn. Crested Grebe. Resident in northern, and winter sojourner in southern, portion.

310. *P. auritus* (Gmel.), var. *Californicus* Lawr. American Eared Grebe. Winter visitant.

Genus *Podilymbus*, Lesson.

*311. *P. podiceps* Linn. Thick-billed Grebe; Carolina Grebe. Resident.

The following is the ratio of the number of species of each family represented in the avifauna of Illinois:—

1.	Mniotiltidæ	36
2.	Fringillidæ	36
3.	Anatidæ	34
4.	Scolopacidæ	25
5.	Falconidæ	20
6.	Laridæ	13
7.	Icteridæ	11
8.	Strigidæ	10
9.	Turdidæ	9
10.	Tyrannidæ	9
11.	Picidæ	9
12.	Ardeidæ	9
13.	Rallidæ	8
14.	Vireonidæ	7
15.	Troglodytidæ	6
16.	Hirundinidæ	6
17.	Paridæ	5
18.	Charadridæ	5
19.	Corvidæ	4
20.	Tetraonidæ	4
21.	Podicepidæ	4
22.	Sylviidæ	3
23.	Caprimulgidæ	3
24.	Phalaropodidæ	3
25.	Colymbidæ	3
26.	Laniidæ	2
27.	Ampelidæ	2
28.	Tanagridæ	2
29.	Cuculidæ	2
30.	Columbidæ	2
31.	Cathartidæ	2
32.	Recurvirostridæ	2
33.	Gruidæ	2
34.	Ciconidæ	1
35.	Ibididæ	1
36.	Saxicolidæ	1
37.	Certhiidæ	1
38.	Motacillidæ	1
39.	Alaudidæ	1
40.	Alcedinidæ	1
41.	Cypselidæ	1
42.	Trochilidæ	1
43.	Psittacidæ	1
44.	Meleagridæ	1
45.	Perdicidæ	1
46.	Hæmatopodidæ	1
47.	Graculidæ	1
48.	Pelecanidæ	1
49.	Plotidæ	1

During the breeding season the ratio stands as follows:—

1.	Mniotiltidæ	21	23.	Cuculidæ	2
2.	Fringillidæ	16	24.	Columbidæ	2
3.	Falconidæ	11	25.	Gruidæ	2
4.	Icteridæ	9	26.	Podicipidæ	2
5.	Picidæ	9	27.	Sylviidæ	1
6.	Anatidæ	9	28.	Saxicolidæ	1
7.	Strigidæ	7	29.	Certhiidæ	1
8.	Scolopacidæ	7	30.	Ampelidæ	1
9.	Ardeidæ	7	31.	Alaudidæ	1
10.	Rallidæ	7	32.	Alcedinidæ	1
11.	Turdidæ	6	33.	Cypselidæ	1
12.	Hirundinidæ	6	34.	Trochilidæ	1
13.	Tyrannidæ	6	35.	Psittacidæ	1
14.	Troglodytidæ	5	36.	Cathartidæ	1
15.	Vireonidæ	5	37.	Meleagridæ	1
16.	Paridæ	4	38.	Perdicidæ	1
17.	Laridæ	4	39.	Charadriidæ	1
18.	Corvidæ	3	40.	Phalaropodidæ	1
19.	Caprimulgidæ	3	41.	Ciconiidæ	1(?)
20.	Tetraonidæ	3	42.	Graculidæ	1
21.	Laniidæ	2	43.	Plotidæ	1
22.	Tanagridæ	2			

Total number of species known to breed within the limits of the State of Illinois, 176.

The species in the following lists are to be looked for, and many of them will no doubt be yet found to occur within the limits of the state.

a. Northern series.

1. *Turdus nævius.* (Iowa; Allen. East Pennsylvania; Turnbull. Long Island; Lawrence. New Jersey; Cabot. East Massachusetts; Maynard.)
2. *Perisoreus Canadensis.* (South Wisconsin; Hoy. Michigan; Fox. East Pennsylvania; Turnbull.)
3. *Canace Canadensis.* (Michigan; Fox.)
4. *Somateria spectabilis.* (Iowa; Allen. North Ohio; Wheaton.)
5. *Larus leucopterus.* (North Ohio; Wheaton.)
6. *Larus glaucus.* (Michigan; Fox.)
7. *Rissa tridactyla.* (North Ohio; Wheaton.)
8. *Xema Sabinei.* (North Ohio; Wheaton. Salt Lake, Utah; Allen.)
9. *Hydrochelidon leucoptera.* (Lake Koskenong, Wisconsin; Kumlein.)
10. *Sterna macroura.* (North Ohio; Wheaton.)
11. *Sterna paradisæa.* (North Ohio; Wheaton.)
12. *Nyctale Richardsonii.* (Iowa; Allen. South Wisconsin; Hoy.)
13. *Anser Rossii.*

b. Western series.

1. *Neocorys Spraguei,*
2. *Plectrophanes ornatus,*
3. " *Maccowni,* } To be sought for on the large prairies.
4. *Centronyx Bairdii,*
5. *Coturniculus Lecontei.*
6. *Zonotrichia querula.* (Common as far east as Lexington and Chillicothe, Missouri; Hoy. Iowa; Allen and Trippe.)

7. *Calamospiza bicolor.* (West Missouri; Hoy.)
8. *Hedymeles melanocephalus.* (Michigan; Fox.)
9. *Tyrannus verticalis.* Iowa; Allen. New Jersey; Turnbull.)
10. *Sayornis Sayus.* (Michigan; Fox.)
11. *Speotyto hypogæa.* (Breeds as far east as Fort Hays, Kansas; Allen.)
12. *Caprimulgus Nuttalli.* (Breeds in eastern Kansas; Allen.)
13. *Falco Richardsonii.* (Kansas; Mus. Smiths Inst. Michigan; Fox. "*F. æsalon.*")
14. *Archibuteo ferrugineus.*
15. *Ægialitis montanus.* (Kansas; Allen. Florida; Maynard.)
16. *Querquedula cyanoptera.* (Florida; Maynard. Louisiana; Pilaté.)

c. Southern series.

35. *Sitta pusilla.* North Ohio; Dr. Kirtland. Probably to be found among the pines — *Pinus mitis* — of south Illinois.
36. *Helinaia Swainsoni,* } To be looked for in swampy portions of
37. *Helminthophaga Bachmani.* } the southern extremity of the state.
38. *Peucæa Cassinii.* (Kansas, breeding; Allen.)
39. *Milvulus tyrannus.* (Henderson, Kentucky, and Mississippi; Audubon. New Jersey; Audubon and Auct.)
40. *Milvulus forficatus.* (Abundant as far north as Indian Territory. Fort Leavenworth; Coues.)
41. *Perissoglossa carbonata.* (Kentucky; Audubon.)
42. *Dendroica Kirtlandii.* (N. Ohio; Dr. Kirtland. Bahamas; Cabot.)
43. *Buteo Harlani.* (Louisiana; Audubon. Texas; Mus. Smiths. Inst. Lawrence, Kansas, Oct., 1871; specimen in Kansas University.)
44. *Ibis alba.* (East Pennsylvania; Turnbull. Salt Lake, Utah; Allen.)
45. *Demiegretta Ludoviciana.* (East Pennsylvania; Turnbull. South Platte; Allen.)
46. *Dendrocygna fulva.* Texas and Louisiana; Dresser, Moore.)
47. *Erismatura dominica.* (Wisconsin; Kumlein. Lake Champlain; Cabot.)
48. *Graculus Mexicanus.* (Lawrence, Kansas, April 2, 1872; Coll. Univ. Kansas. Undoubtedly to be found on the lower Wabash.)

PUBLICATIONS

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CONTENTS.

IV.—On the Lingual Dentition of Helix turbiniformis, Pfr., and other species of Terrestrial Mollusca. By THOMAS BLAND and W. G. BINNEY. 79

V.—Notes on the Ascidea Manhattensis, De Kay, and on the Mammaria Manhattensis. By THEO. A. TELLKAMPF, M.D. 83

VI.—Notes on North American Crustacea, in the Museum of the Smithsonian Institution. No. III. By WILLIAM STIMPSON, M.D. 92

VII.—Descriptions of three New Species of American Birds, with a Note on Eugenes spectabilis. By GEO. N. LAWRENCE . 137

Vol. X. February, 1874. No. 14.

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XXXIV.—*Descriptions of Six supposed New Species of American Birds.*

BY GEORGE N. LAWRENCE.

Read February 9, 1874.

1. Chlorospingus brunneus.

THE entire plumage is of a dark rusty-brown, brighter on the throat and neck in front, and deeper in color on the back, rump and upper tail coverts; the wing coverts have their margins just perceptibly brighter in color; quills brownish-black, their outer webs narrowly edged with the same color as that of the back; under wing coverts brownish-ash; tail purplish black: upper mandible blackish horn color, the under whitish; tarsi and toes hazel-brown. Length (skin) 5½ in.; wing 2 11-16; tail 2⅜; bill 7-16; tarsi 11-16.

Habitat.—Costa Rica, Volcan de Irazu.

Remarks.—In its general dark brown plumage this species is unlike any members of the genus to which I have assigned it.

Two species (sex not determined) are in a collection of birds made in Costa Rica, in the spring of 1873, by Mr. J. Zeledon, Zoologist under Prof. W. M. Gabb, Chief of the Talamanca Costa Rica Exploring Expedition.

This collection was forwarded to the National Museum at Washington, and has been placed in my hands for determination.

2. Chlorospingus axillaris.

Male. Upper part and sides of the head and the hind neck, olive-green, back and rump of the same color, washed with yellowish-fulvous, having a brighter appearance than the head; upper tail coverts glossy black; two middle tail feathers greenish-olive, the others brownish-olive, the outer webs of all broadly margined with fulvous of the same color as the back; wing coverts similar in color to the back, the larger ones broadly edged with clear pale fulvous; quills of a rather light brown, their outer margins of the same color as the back; under wing coverts and inner margins of quills white, axillars pale yellow; entire under plumage fulvous yellow, clearer in color on the abdomen and of a brighter fulvous on the flanks and under tail coverts; bill whitish horn color, brown at the base; tarsi and toes pale plumbeous. Length (skin) 5¾ in.; wing 2½; tail 2½; bill ½; tarsi ⅝.

Habitat.—Costa Rica, Volcan de Irazu. Talamanca Expedition.

Remarks.—This specimen I judge to be immature, for besides the black upper tail coverts, there are a few scattered black spots on the front and two on one side of the neck, which would seem to indicate that it was undergoing a change of plumage. At one time I thought it was perhaps the young of the preceding species, but the tail coverts and spots above spoken of, being black in color instead of brown, do not favor such a supposition; in *C. axillaris* the wings are shorter and the tail feathers narrower.

Further collections will soon be received from the expedition, when I hope to be enlightened by other examples.

3. Buarremon atricapillus.

Entire head above, cheeks and hind neck deep black; back, upper tail coverts, wing coverts and outer margins of quills, of a clear yellowish-green; bend of wing bright yellow; quills and tail feathers brownish-black; throat, breast and abdomen pure white; sides cinereous tinged with yellowish-green; under tail coverts dark ashy-brown, some of the shorter feathers with white shaft stripes and edged with the same, the longer coverts washed with greenish; bill black; tarsi and toes brownish-black. Length (skin) 7¼ in.; wing 3¾; tail 3½; tarsi 1; bill from front 11-16; high at base ⅜.

Habitat.—Thought to be from Bogota, and from the make-up of the skin I think the supposition is correct.

Remarks.—The species is of about the size, and somewhat resembles *B. assimilis* in coloring, but the upper plumage has more of a yellow shade, and the under plumage is more white, the ashy coloring not extending so much on the sides of the breast and abdomen; the bill is higher and more arched than in any of its allies, and it is distinguished from all others of the genus, by its entirely black head and hind neck.

4. Phonipara fumosa.

The entire plumage is of a fuliginous-black, inclining more to black on the throat and breast; the outer webs of the quill feathers edged narrowly with gray; the shafts of the tail feathers underneath are whitish; bill black; tarsi and toes brown. Length (skin) 4⅜ in.; wing 2⅜; tail 1¾; tarsi ⅝.

Habitat.—Trinidad. Collected by Mr. A. H. Alexander.

Remarks.—This species differs from its congeners by its general smoky coloring, all others of the genus are characterized by a greater or less extent of olivaceous in their plumage.

5. Cyanospiza rositæ.

Adult male. Lores and capistrum black, upper part and sides of the head, throat, entire plumage above, smaller wing coverts and rump, of a fine azure blue, more intense on the head and throat, paler on the back and rump; a white circle around the eye; chin grayish-white; breast and upper part of abdomen of a fine rose red, but largely bordered with blue, in a manner to make these parts appear as if mixed with red and blue; lower part of abdomen and under tail coverts pale rose red, tinged with pale blue; tibia dull blue; wings grayish-black, the larger coverts and the quills bordered outwardly with bluish; the two middle tail feathers entirely blue above, the others of an ashy-blue on the inner webs and bluish exteriorly, there is a narrow border of whitish on the inner web of these same tail feathers; the tail underneath is of a pale ashy-blue; the shafts of the rectrices are black above and white below; iris brown; upper mandible blackish, the under pale bluish; feet livid plumbeous.

"Longueur tot. 14 centimetres; aile 72 millimetres; queue 55 millim.; bec (le long de culmen) 11 millim.; tarse 15 millim."

Habitat.—Mexico, Tehuantepec.

Remarks.—I have named this species after the wife of my friend Prof. F. Sumichrast, and think it but a fitting compliment that her name should be borne by so beautiful a bird.

In Feb., 1872, Prof. Sumichrast sent me the description from which the above account is transcribed—writing that he thought it a new species, and would send the specimen on for my decision. Considering it to be new, I requested him to do so, but no opportunity offered until April of last year; it was then sent, and also examples of the female and young, afterwards obtained. They were enclosed in a box coming for the Smithsonian Institution; unfortunately, up to this time (Feb., 1874) no tidings of the box has been received.

Under the circumstances, I concluded not to delay its publication any longer, as Prof. Sumichrast's description taken from the bird is very minute.

At some future time I hope to receive specimens and give descriptions of the female and young, and on examination should the male differ from the description given, in any important particular, to make it known.

It seems quite unlike any of the allied species in the handsome group to which it belongs.

Prof. Sumichrast says, this pretty species equals, if it does not surpass, by the elegance of its plumage, its congeners *C. ciris* and *C. leclancheri.*

In a letter dated Nov., 1873, he writes, alluding to the specimens forwarded (which he supposed I must have received), that the species seemed very rare, as he had procured no more examples.

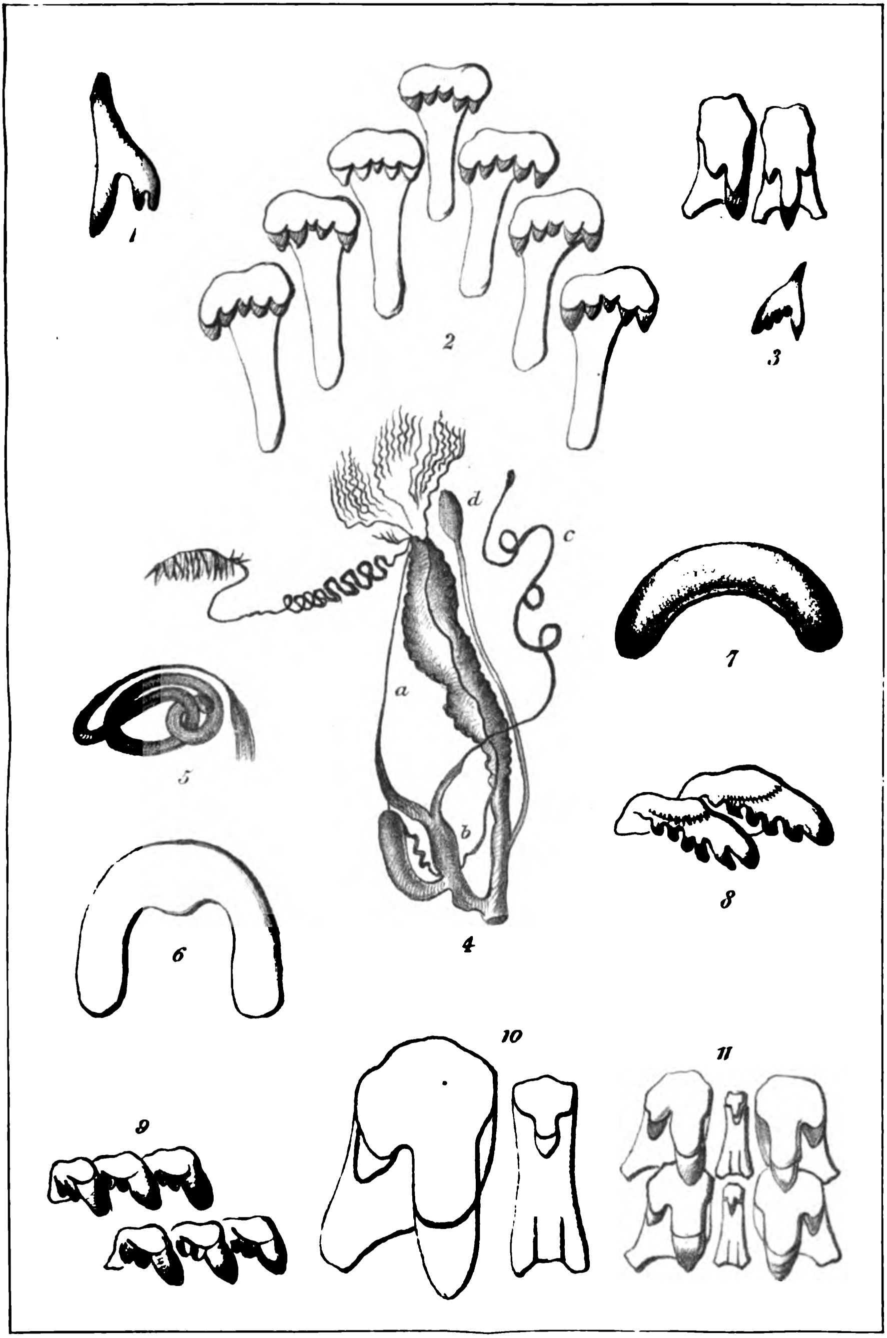
6. Thripadectes virgaticeps.

Front, crown, cheeks and hind neck blackish brown, the feathers of all these parts with broad shaft stripes, those of the crown and hind neck grayish-white, the others of a pale rufous; upper part of the back dull, reddish-brown, the lower part of the back and rump deep bright cinnamon; tail brownish cinnamon; wing coverts and outer webs of quills also cinnamon-brown, but of not so deep a color as the tail; the inner webs of the quill feathers are dark brown, with their inner margins broadly marked with pale cinnamon; under wing coverts bright cinnamon; the feathers of the chin and upper part of the throat are reddish fulvous, with brownish-black margins; the under plumage is of a rather dull cinnamon red, brownish on the lower part of the neck; bill black, tarsi and toes dark brown. Length (skin) 8½ in.; wing 4⅛; tail 4; bill 1; tarsi 1 3-16.

Habitat.—Ecuador, Quito.

Remarks.—This I consider to be a second species of Thripadectes, *T. flammulatus* (Eyton) having been the sole representative of the genus heretofore. It is about the size of that species, perhaps rather stouter in form, the bill very decidedly longer and larger; the very distinct flammulations over the entire body of *T. flammulatus* will readily serve to distinguish them.

Belonging to a family very difficult to investigate satisfactorily, and having an opportunity last summer to send it to Mr. Sclater, I did so, asking his opinion; he wrote that it was unknown to him, hence I have no hesitation in describing it as new.



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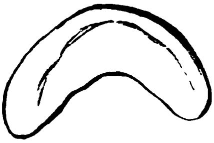

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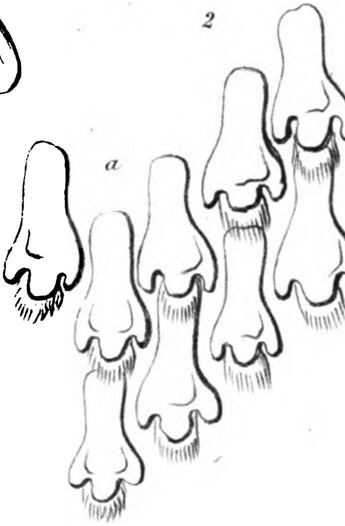

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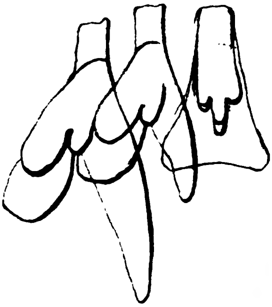

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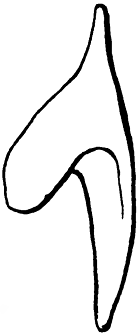

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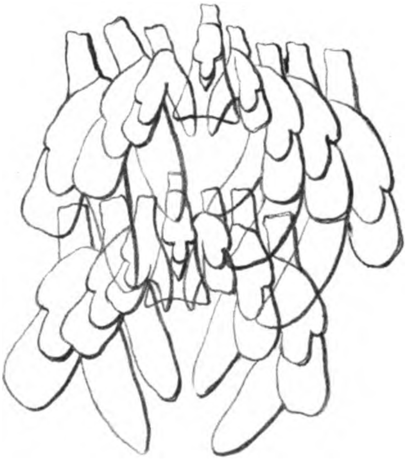

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INDEX.

[The names of new species are printed in Roman letters; synonymes and species to which reference is made, are in *Italics;* names of sub-families, families, or higher divisions, in SMALL CAPITALS.]

Acanthistius, 45.
Acanthonyx Petiveri, 97.
Acanthophrys, 96.
ACANTHOPTERI, 30, 31.
ACANTHOPTERYGII, 30.
Achatina, 168.
fasciata, 80.
virginea, 80.
Achatinella, 331, 332, 333, 334, 335, 337.
bulimoides, 331, 333.
fulgens, 332.
Johnsonii, 332, 333, 335, 336, 337.
livida, 332, 335, 336, 337.
lorata, 333.
marmorata, 332.
producta, 332, 333, 336, 337, 351.
rubens, 333.
splendida, 332.
Tappaniana, 332.
varia, 332, 335, 336, 337.
vulpina, 332.
Acheloüs acuminatus, 112, 113.
anceps, 113.
Gibbesii, 111.
panamensis, 112.
transversus, 111.
Acidops, 110.
fimbriatus, 111.
ACIPENSERIDI, 30.
Acrobasis rubrifasciella, 267.
Actaea Dovii, 104.
erosa, 104.
setigera, 104.
Actiturus, 384.
Bartramius, 384.
Actodromus, 384.
Ægialitis, 383.
hiatacula, 383.
melodus, 383.
montanus, 394.
vociferus, 383.
Ægiothus, 372.
canescens, 372.
linarius, 372.
Æpyornis, 141.
Æsalon, 379.
AGELAINÆ, 374.
Agelaius, 374.
phœniceus, 374.
Aix, 389.
sponsa, 389.
ALAUDIDÆ, 374, 392, 396.
Alcadia, 316.
hirsuta, 187.
minima, 316.
ALCEDINIDÆ, 376, 392, 393.
ALECTORIDES, 387.
Alphestes, 39, 45.
Amastra, 334.
decorticata, 332, 333.
luctuosa, 332, 333, 337.
Mastersi, 331, 332, 333, 337.
Amastra *nigrolabris*, 332, 333.
Ammodromus, 372.
Henslowi, 372.
passerinus, 372.
AMPELIDÆ, 371, 392, 393.
AMPELINÆ, 371.
Ampelis, 371.
cedrorum, 371.
garrulus, 371.
Amphibulima, 198, 199, 201, 202, 224, 343.
felina, 204, 346.
pardalina, 201, 202, 224.
patula, 201, 202, 204, 223, 224, 225, 257, 344, 345.
rubescens, 345.
tigrina, 202.
Amphidesma, 197.
AMPHIOXIDI, 30.
AMPHIPHARYNGODONTES, 30.
ANACANTHINI, 30.
Anas, 388.
acuta, 389.
Americana, 389.
boschas, 388.
Carolinensis, 389.
clypeata, 389.
discors, 389.
obscura, 388.
penelope, 389.
streperus, 388.
ANATIDÆ, 388, 392, 396.
ANATINÆ, 388.
Anorthura, 367.
ANSERINÆ, 388.
Anser, 388.
albifrons, 388.
bernicla, 388.
Canadensis, 388.
cærulescens, 388.
hyperboreus, 388.
Rossii, 398.
Anthias, 66, 68.
Caballerote, 78.
sacer, 68.
ANTHINÆ, 367.
Anthus, 367.
Ludovicianus, 367.
Apex, 333. 334.
pallida, 332, 333.
APODES, 30.
Apogon, 32.
Apoma, 24.
Aptenodytes *Pennantii*, 147.
Apteryx, 141.
Aquila, 381.
chrysoetus, 381.
Archibuteo, 381.
ferrugineus, 394.
lagopus, 381.
Ardea, 386.
cœrulea, 148.
herodias, 386.

ARDEIDÆ, 386, 392, 393.
Ardetta, 386.
  exilis, 386.
Argis *lar*, 125.
Argyrops, 172.
Ariolimax, 163, 294, 298, 299.
  Californicus, 298, 299, 300.
  Columbianus, 298, 300.
  niger, 298, 301, 310.
Arion, 163, 294.
  ?*Andersonii*, 297.
  foliolatus, 297.
ARIONIDÆ, 162, 164.
Arquatella, 384.
Ascidea *intestinalis*, 89.
  Manhattensis, 83.
ASTACOIDEA, 123.
Astur, 380.
ATELEOCEPHALI, Poey, 30.
Attila cinnamomeus, 8.
  citreopygius, 9.
  sclateri, 9.
Auriculella, 334.
  jucunda, 331, 332.
  solida, 332.
  solidissima, 331, 332.
Aylopon, 68.
Aythya, 389.

Balæniceps *rex*, 142, 149.
BALISTIDI, 30.
Baltimorite, 327.
Batissa, 191, 194, 195, 196.
Berendtia, 25.
Binneia, 163, 210, 224, 300.
Biotite, 330.
BLENNIDI, 30.
Bodianus, 48.
  bodianus, 48.
  melanoleucus, 44.
Bonasa, 382.
  umbellus, 382.
Botaurus, 387.
  lentiginosus, 387.
Bothrodendron, 275.
Botys, 258, 267.
  ablutalis, 261.
  alpinalis, 261.
  Californicalis, 269.
  fodinalis, 257, 263.
  inquinitalis, 271.
  mustelinalis, 262.
  perrubralis, 264.
  profundalis, 261.
  semirubralis, 263.
  subolivalis, 261.
  unifascialis, 261.
Brachyotus, 378.
Brachyrhinus, 33, 34, 46.
  furcifer, 34.
Brachyspira, 198, 202, 203, 224.
Branta, 388.
Buarremon atricapillus, 396.
  assimilis, 396.
  leucopterus, 139.
  pallidinuchus, 139.
  sordidus, 138.
Bubo, 379.
  scandiaca, 379.
  Virginianus, 379.
BUBONINÆ, 378.
Bucephala, 389.
  albeola, 389.
  clangula, 389.
Bucholzite, 326.
Bulimella, 332, 334.
Bulimella *tæniolata*, 332.
Buliminus, 349.
  montanus, 349.
Bulimulus, 80, 160, 163, 166, 167, 206, 209, 222, 225, 316, 317.
  alternatus, 80.
  aureolus, 80.
  aurisleporis, 80, 199, 206.
  Bahamensis, 82.
  dealbatus, 81.
  Jonasi, 80.
  laticinctus, 81, 82, 206.
  membranaceus, 80.
  pallidior, 80, 161.
  papyraceus, 80, 199, 206.
  sepulcralis, 317, 347.
  sufflatus, 80.
Bulimus, 166.
  aulacostylus, 222.
  auris-sileni, 222.
  multifasciatus, 223.
  Viequensis, 22.
Buteo, 381.
  borealis, 381.
  Harlani, 394.
  lineatus, 381.
  Pensylvanicus, 381.
  Swainsoni, 381.
BUTEONINÆ, 380.
Butorides, 386.
  virescens, 386.

Calaclysta *lemnalis*, 265.
  metalliferalis, 265.
Calamospiza *bicolor*, 394.
Calamus, 172, 173, 181.
  Bajonado, 174, 176.
  macrops, 176, 181.
  megacephalus, 176, 178.
  microps, 182.
  orbitarius, 176, 179, 181, 182.
  penna, 177, 178.
  pennatula, 179, 180.
  plumatella, 180, 181, 182.
Calappa *convexa*, 114.
  Xantusiana, 114.
Calcium, 325, 330.
Calidris, 384.
  arenaria, 384.
Callianassa *grandimana*, 122.
  major, 122.
Callichirus, 122.
Callinectes, 111.
Callonia, 24.
  Elliotti, 24.
Canace *Canadensis*, 393.
Cancer *Rumphii*, 106.
  setiferus, 133.
  spinus, 126.
CANCROIDEA, 103.
Cantharina, 171.
CAPRIMULGIDÆ, 376, 392, 393.
CAPRIMULGINÆ, 376.
Caprimulgus, 376.
  Carolinensis, 376.
  Nuttalli, 394.
  vociferus, 376.
Caprodon, 71.
Capsula, 197.
Caracolus, 169, 221.
CARANGIDÆ, 50.
Cardinalis, 374.
  Virginianus, 374.
Carelia, 334.
CARIDEA, 123.
Carpilius *cinctimanus*, 103.

- Carpodacus, 371.
  - *purpureus*, 371.
- Casta, 24.
- Catharista, 381.
  - *atrata*, 381.
- CATHARTIDÆ, 381, 392, 393.
- Centronyx *Bairdii*, 393.
- Centropomus, 32.
- Centropristis, 34, 51.
  - *aurorubens*, 61.
  - *merus*, 34.
  - *tabicarius*, 52.
- Centurus, 378.
- Ceratoplax *ciliatus*, 111.
- Certhia, 366.
  - *familiaris*, 366.
- CERTHIIDÆ, 366, 392, 393.
- Cervus *Virginianus*, 218, 219.
  - Yucatanensis, 218.
- Ceryle, 376.
  - *alcyon*, 376.
- Chætopterus, 120.
- CHÆTURINÆ, 376.
- Chætura, 376.
  - *pelagica*, 376.
- CHARADRIDÆ, 383, 392, 393.
- Charadrius, 383.
  - *helveticus*, 383.
  - *pluvialis*, 383.
- Chaulelasmus, 388.
- Chen, 388.
- CHIMÆRIDÆ, 30.
- Chlorodius *Floridanus*, 108.
  - occidentalis, 108.
- Chlorospingus brunneus, 395.
  - axillaris, 395.
- Chlorostilbon caribæus, 13.
  - *atala*, 14.
- Chondestes, 372.
  - *grammaca*, 372.
- Chondropoma, 316.
  - *canescens*, 316.
- CHONDROSTEI, 30.
- Chordeiles, 376.
  - *popetue*, 376.
- CHORIPHARYNGODONTES, 30, 31.
- Chorististium, 72.
  - *rubrum*, 72.
- Chroicocephalus, 391.
  - *atricilla*, 391.
  - *Franklinii*, 391.
  - *Philadelphia*, 391.
- Chrysoblephus, 172.
- Chrysomitris, 371.
  - *pinus*, 372.
  - *tristis*, 371.
- Chrysophrys, 172, 173, 176.
  - *calamus*, 178.
- CHRYSOTILE, 327.
- CICONIIDÆ, 385, 392, 393.
- Cionella, 163, 316.
- Circus, 380.
  - *cyaneus*, 380.
- Cistothorus, 367.
  - *equatorialis*, 3.
  - *palustris*, 367.
  - *stellaris*, 3, 367.
- Cistula, 316.
  - *scabrosa*, 316.
- Clausilia, 220, 350.
- COCCOTHRAUSTINÆ, 371.
- Coccothraustes, 371.
  - *vespertinus*, 371.
- COCCYGINÆ, 377.
- Coccygus, 377.
  - *Americanus*, 377.
- Coccygus *erythrophthalmus*, 377.
- Colaptes, 378.
  - *auratus*, 378.
- Collurio, 371.
  - *borealis*, 371.
  - *Ludovicianus*, 371.
- COLUMBÆ, 382.
- COLUMBIDÆ, 382, 392, 393.
- COLYMBIDÆ, 392.
- Colymbus, 392.
  - *arcticus*, 392.
  - *glacialis*, 392.
  - *septentrionalis*, 392.
- Comptonia *asplenifolia*, 268.
- Contopus, 376.
  - *borealis*, 376.
  - *virens*, 376.
- Conulus, 307. 316.
  - *Gundlachi*, 317.
- Conurus, 378.
  - *Carolinensis*, 378.
  - holochlorus, 15.
- Conus, 190.
- Corbicula, 191, 193, 194, 195, 196.
  - *consobrina*, 196.
  - *Japonica*, 188.
- CORBICULADÆ, 188, 196.
- CORVIDÆ, 375, 392, 393.
- CORVINÆ, 375.
- Corvus, 375.
  - *Americanus*, 375.
  - *corax*, 375.
- Coturniculus, 372.
  - *Lecontei*, 393.
- Cotyle, 370.
  - *riparia*, 144, 155, 156, 157, 370.
- Crangon *lar*, 125.
- Cromileptes, 39.
- Cryptodia *granulata*, 102.
- Ctenopoma, 316.
- CUCULIDÆ, 377, 392, 393.
- Cupidonia, 382.
  - *cupido*, 382.
- Cyanospiza rositæ, 397.
  - *ciris*, 398.
  - *leclancheri*, 398.
- Cyanura, 375.
  - *cristata*, 375.
- Cyanospiza, 373.
  - *ciris*, 374.
  - *cyanea*, 373.
- CYCLADEA, 196, 197.
- Cyclas, 196.
- CYCLASIDÆ,, 196.
- CYCLOSTOMI, 30.
- Cyclostomus, 316.
- CYGNINÆ, 388.
- Cygnus, 388.
  - *Americanus*, 388.
  - *buccinator*, 388.
- Cylindrella, 24, 25, 27, 161, 163, 166, 167, 168, 206, 209, 222, 225, 316.
  - *Agnesiana*, 24.
  - *Bahamensis*, 24.
  - *Brooksiana*, 24.
  - *costata*, 24.
  - *elongata*, 24.
  - *gracilis*, 24, 27.
  - *rosea*, 80, 225.
  - *sanguinea*, 27.
  - *Trinitaria*, 25.
- CYLINDRELLIDÆ, 24, 25, 160, 161.
- Cynthia, 86.
- CYPRINIDI, 30.
- CYPSELIDÆ, 376, 392, 393.
- Cyrena, 196.

Cyrena *antiqua*, 188.
Carolinensis, 191, 195, 197.
cuneiformis, 188.
Floridana, 191, 194, 195, 197.
oblonga, 189.
orientalis, 188.
placens, 189.
truncata, 188.
Cyrenella, 196.
CYRENIDÆ, 196.
Cyrenocapsa, 195, 196.

Dafila, 389.
Demiegretta *Ludoviciana*, 394.
Dendrocygna *fulva*, 394.
DENDROICÆ, 368.
Dendroica, 368.
æstiva, 144, 155, 156, 157, 368.
Blackburniæ, 368.
castanea, 368.
cærulea, 368.
cærulescens, 368.
coronata, 368.
discolor, 369.
dominica, 368.
Kirtlandii, 394.
maculosa, 368.
palmarum, 369.
Pensylvanica, 368.
pinus, 368.
striata, 368.
virens, 368.
Dentellaria, 221, 301, 302.
DERMOPTERI, 30.
Diacope, 63.
Dinornis, 141.
crassus, 145.
DIODONTIDI, 30.
Diplectrum, 34, 54.
radians, 34.
Diplodonta, 196.
Dolichonyx, 374.
oryzivorus, 374.
DONACIDÆ, 197.
Donax, 197.
Dryocopus, 377.
pileatus, 377.

Ebalia *mammillosa*, 116.
Ectopistes, 382.
migratoria, 382.
Elainea Macilvainii, 10.
placens, 10.
Elanus, 380.
leucurus, 380.
ELASMOBRANCHII, 30.
ELASMOGNATHA, 346.
Elastoma, 68, 70.
Empidonax, 376.
acadicus, 376.
Bairdii, 11.
flaviventris, 376.
fulvipectus, 11.
Hammondi, 11.
minimus, 376.
pusillus, 376.
Enneacentrus, 34. 39. 50, 51.
dubius, 51.
punctulatus, 34.
Epialtus, 98.
Epinephelus, 34, 38, 42, 46.
afer, 45.
Cubanus, 34.
flavolimbatus, 34.
impetiginosus, 34.
limbatus, 34.
Epinephelus *lunulatus*, 34.
morio, 34, 51.
niveatus, 34, 43.
striatus, 34.
Eremophila, 374.
alpestris, 374.
Ereunetes, 384.
pusilla, 384.
Erinna, 349.
Newcombi, 349.
Erismatura, 390.
dominica, 394.
rubida, 390.
Eromene *bella*, 264.
Californicalis, 264.
Etelis, 59, 66, 67, 70.
carbunculus, 68.
oculatus, 59.
Eucalodium, 24, 25.
Eudorea ? *albisinuatella*, 271.
Eudorea centuriella, 271.
frigidella, 271.
Eugenes *fulgens*, 140.
spectabilis, 140.
Eupleurodon, 98.
trifurcatus, 98.
Eurytus, 222.
Euspiza, 378.
Americana, 373.

FALCONIDÆ, 379, 392, 393.
FALCONINÆ, 379.
Falco, 379.
columbarius, 379.
communis, 379.
lanarius, 379.
Richardsonii, 394.
sparverius, 379.
Falcinellus, 386.
Fischeria, 196.
Florida, 386.
Fragilia, 197.
FRINGILLIDÆ, 371, 392, 393.
FULICINÆ, 387.
Fulica, 387.
Americana, 387.
Fuligula, 389.
Americana, 389.
collaris, 389.
marila, 389.
Vallisneria, 389.
Fulix, 389.

GADIDI, 30.
Gæotis, 252, 253, 255, 257, 342, 345.
Galatea, 193, 194, 195, 196, 197.
Galeoscoptes, 365.
Carolinensis, 365.
GALLINÆ, 382.
Gallinago, 383.
gallinaria, 383.
Gallinula, 387.
chloropus, 387.
martinica, 387.
GALLINULINÆ, 387.
GANOIDEI, 30.
GARRULINÆ, 375.
Garzetta, 386.
cærulea, 386.
candidissima, 386.
Gelochelidon, 391.
Genyroge, 63.
Geomalacus, 294, 308.
maculosus, 308, 309.
GEOPHILA, 162.
GEOTHLYPEÆ, 369.

Geothlypis, 369.
Glandina, 159, 162, 317, 333.
ligulata, 162.
monilifera, 162.
Glauconome, 189.
Glypturus, 120.
acanthochirus, 121.
Gnidon, 31.
GOBIDI, 30.
GOBIOSOMI, 30.
Gonidomus, 222.
GONIOGNATHA, 80, 166, 168.
Gonioplectrus, 35, 45, 57, 58.
hispanus, 35.
Gonospira, 222.
palanga, 159, 222.
GRACULIDÆ, 390, 392, 393.
Graculus, 390.
dilophus, 390.
Mexicanus, 394.
Gramma, 33, 74.
Loreto, 75.
Grammateus, 172, 176, 182.
humilis, 182, 183.
medius, 183.
GRUIDÆ, 387, 392, 393.
Grus, 387.
Americanus, 387.
Canadensis, 387.
Grystes, 32.
Guiraca, 373.
cærulea, 373.
GYMNODONTI, 30.

HÆMATOPODIDÆ, 388.
Hæmophila Sumichrasti, 6.
melanotis, 6.
Haliaëtus, 381.
leucocephalus, 381.
Halimus, 96.
Haliperca, 33, 34, 52, 54.
bivittata, 34, 54.
fuscula, 34.
Jacome, 34.
Phœbe, 34.
præstigiator, 34.
Harelda, 390.
glacialis, 390.
Harporhynchus, 365.
Graysoni, 1.
rufus, 365.
Hedymeles, 373.
Ludovicianus, 373.
melanocephalus, 394.
HELICACEA, 169.
HELICEA, 220, 221, 255.
HELICIDÆ, 25, 160, 161, 162, 164, 167, 169, 220, 225, 333, 342.
Helicina, 316.
fasciata, 223.
Gloynei, 186.
HELICINÆ, 163, 165, 171, 200, 201, 206, 224, 255, 309, 333, 335, 340, 346.
Helicterella, 334.
Helinaia *Swainsoni*, 394.
Helisiga, 199.
Helix, 80, 162, 163, 166.
algira, 165.
alternata, 80.
appressa, 312.
asteriscus, 80.
Berlandieriana, 363.
Bermudensis, 221.
candidissima, 220.
circumfirmata, 221.
Columbiana, 304, 310.
Helix *dentiens*, 303.
dentifera, 362.
divesta, 362.
Edvardsi, 362.
gallopavonis, 342.
germana, 304, 310.
graminicola, 342.
Hemphilli, 80.
inæqualis, 159, 162.
Isabella, 303.
invalida, 306.
inversicolor, 169.
Jayana, 219.
jejuna, 363.
Josephinæ, 306.
labyrinthica, 80.
leucostyla, 169.
lychnuchus, 301, 302, 305, 311.
militaris, 169, 170.
minutissima, 306, 308.
Mobiliana, 362, 363.
muscarum, 80, 254, 255, 341.
orbiculata, 303.
pachygastra, 305.
perplexa, 221, 303.
Phœnix, 80.
picta, 341, 342, 351.
provisoria, 317, 347.
pygmæa, 306, 307, 308.
Rœmeri, 362.
rufozonata, 169.
Schrammi, 22, 23.
striatella, 80.
sulphurosa, 341.
Troscheli, 342, 343.
turbiniformis, 79, 81, 82, 206.
uvulifera, 339.
varians, 342.
versicolor, 342.
Wetherbyi, 361.
Helmitherus, 368.
vermivorus, 368.
Helminthophaga, 368.
Bachmani, 394.
celata, 368.
chrysoptera, 368.
peregrina, 368.
pinus, 368.
ruficapilla, 368.
Hemitrochus, 342.
Hemphillia, 208, 209, 210, 300.
glandulosa, 208, 209, 210, 211.
Herbstia, 93.
condyliata, 93.
depressa, 93.
Edwardsii, 93.
parvifrons, 93, 94.
pubescens, 92.
pyriformis, 93.
Herbstiella, 93.
camptacantha, 94, 95.
depressa, 93.
tumida, 95.
Herodias, 386.
alba, 386.
HERODIONES, 385.
Hesperanthias, 68.
Hesperiphona, 371.
Heterocrypta, 102.
granulata, 103.
macrobrachia, 103.
HETEROSOMI, 30.
Hierofalco, 379.
Himantopus, 385.
nigricollis, 385.
HIPPOCAMPIDI, 30.

HIPPOIDEA, 120.
Hippolysmata Californica, 123.
Hippolyte *Fabricii*, 126.
Gaimardii, 126.
Sayi, 125.
palpator, 125.
Phippsii, 125.
picta, 125.
pusiola, 127.
sitchænsis, 125.
Sowerbei, 126.
spina, 126.
spinus, 126.
vibrans, 125.
Wurdemanni, 124.
HIRUNDINIDÆ, 370, 392, 393.
Hirundo, 370.
lunifrons, 144, 155, 156, 157.
horreorum, 370.
Histrionicus, 390.
torquatus, 390.
HOLOCEPHALI, 30.
Holospira, 25, 161, 162, 163.
Goldfassi, 163.
Roëmeri, 162.
HOLOSTEI, 30.
Hyalimax, 209, 210.
Hyalina, 163, 164, 253.
Baudoni, 159.
capsella, 164.
cellaria, 164.
demissa, 164,
fuliginosa, 164.
indentata, 164.
inornata, 164.
interna, 165.
intertexta, 164.
lævigata, 164.
lasmodon, 164.
ligera, 164.
minutissima, 307.
multidentala, 164.
nitida, 161.
olivetorum, 164.
suppressa, 164.
turbiniformis, 254.
Hylocichla, 365.
Hylotomus, 377.
HYPEROARTII, 30.
HYPEROTRETI, 30.
HYPOPLECTRINI, 33.
Hypoplectrodes, 45.
Hypoplectrus, 33, 35, 45, 55, 78.
aberrans, 35, 78.
accensus, 35.
affinis, 35.
bovinus, 35.
gummigutta, 35.
guttavarius, 35, 78.
indigo, 35.
maculiferus, 35, 78.
nigricans, 35.
pinnavarius, 35.
puella, 35, 73.
vitulinus, 35.
Hypothrodus, 44.
flavicauda, 44.
HYPOTREMI, 30.

IBIDIDÆ, 386, 392.
IBIDINÆ, 386.
Ibis, 386.
alba, 394.
falcinellus, 386.
Icteria, 369.
virens, 369.
ICTERIÆ, 369.
ICTERIDÆ, 374, 392, 393.
ICTERINÆ. 375.
Icterus, 375.
Baltimore, 375.
formosus, 184.
gularis, 185.
mentalis, 185.
pustulatus, 185.
Sclateri, 185.
spurius, 375.
Ictinia, 380.
Mississippiensis, 380.
Iphigenia, 196, 197.

Jefferisite, 327, 328.
JUGULATI, 30.
Junco, 373.
hyemalis, 373.

Kæmmererite, 327.

Labiella, 334.
Labrus *Anthias*, 68.
rufus, 48.
Lælaps, 145.
Lagopus, 382.
albus, 382.
Lambrus depressiusculus, 101.
excavatus, 98.
hyponcus, 98.
LAMELLIROSTRES, 388.
Laminella, 333, 334, 335, 336.
decorticata, 336.
luctuosa, 335, 336.
Mastersi, 335, 336, 337, 351.
picta, 331, 333, 335, 336.
LANIIDÆ, 371, 392, 393.
LARIDÆ, 391, 392, 393.
LARINÆ, 391.
Larus, 391.
argentatus, 391.
Delawarensis, 391.
glaucus, 393.
leucopterus, 393.
marinus, 391.
Lates. 31.
Leander pandaliformis, 130.
LEMNISCATI, 30.
Lepidodendron, 275.
LEPIDOSIRENIDÆ, 30.
LEPIDOSTEIDI, 30.
Leptachatina, 333, 334, 335, 336.
Leptachatina *dimidiata*, 332, 333.
grana, 331, 333, 336.
nitida, 331, 333, 336, 351.
Leptinaria, 316.
LEPTOCARDII, 30.
LEPTOCEPHALI, 30.
Leptomerus, 316.
sepulcralis, 317.
Leptoptila bonapartii, 15.
albifrons, 16.
brachyptera, 16.
plumbeiceps, 16.
rufaxilla, 16.
Leptosiphon, 195, 196.
Lethrinus, 172.
Leucochila, 316, 317.
fallax, 318.
pellucida, 318.
Leucochroa, 220, 221, 303.
Boissieri, 220, 303.
candidissima, 303.
LEUCOSOIDEA, 114.
Lia, 24.

Lia *Blandiana*, 25.
  flexuosa, 25.
  Gossei, 25.
  macrostoma, 25.
  maugeri, 25.
  Paivana, 25.
  tricolor, 25.
  virginea, 25.
  zebrina, 25.
Liguus, 163, 168, 254, 252, 342.
  fasciatus, 254.
Limax, 159, 163, 294, 299.
  Hewstoni, 349.
  maximus, 159.
LIMICOLÆ, 383.
Limnæa, 256, 349.
LIMNÆIDÆ, 349.
Limosa, 385.
  fedoa, 385.
  Hudsonica 385.
Liochila, 341.
  Jamaicensis, 341.
Liomera *cinctimana*, 103.
  lata, 104.
Lioperca, 34, 40, 42.
  inermis, 34, 43.
Liopropoma, 72, 73.
  aberrans, 72.
Liostracus, 316.
Lithadia *Cumingii*, 116.
  pontifera, 115.
Lithium, 326, 327, 328, 329.
Lithognathus, 172.
Lithotis *rupicola*, 346.
  tumida, 346.
Lobipes, 385.
  hyperboreus, 385.
  Wilsonii, 385.
LONGIPENNES, 391.
LOPHIDI, 30.
LOPHOBRANCHII, 30.
Lophodytes, 390.
Lophophanes, 366.
  bicolor, 366.
Loxia, 372.
  curvirostra, 372.
  leucoptera, 372.
Lucina, 196.
Lupea *anceps*, 113.
  Duchassaqni, 113.
Lutianus *Lutianus*, 62.
LUTJANINÆ, 60, 63, 70.
LUTJANINI, 33, 50, 58, 70, 74.
Lutjanus, 59, 62.
  analis, 59.
  Aubrieti, 59.
  Buccanella, 59.
  Caballerote, 59, 75, 76, 77, 78.
  Campechianus, 59.
  Caxis, 59, 63, 75, 76, 77.
  Cubera, 59, 75, 76, 77.
  cynodon, 75.
  Jocu, 59, 75, 76.
  Ojanco, 59, 64.
  profundus, 59.
  rosaceus, 59.

Macroceramus, 25, 26, 27, 160, 162, 163, 166, 206, 225, 316, 322.
  Gossei, 160, 162, 168, 317, 322.
  Gundlachi, 322.
  microdon, 322.
  signatus, 322.
  turricula, 22.
Macrocyclis, 159, 163, 305.
  Baudoni, 305.
Macrops, 68.
Macrorhamphus, 383.
  griseus, 383.
MALACANTHIDI, 30.
MALACOPTERI, 30.
MALACOPTERYGII, 30.
Mammaria, 84, 85, 86, 87.
Mareca, 389.
Margarodite, 329.
Melanerpes, 378.
  Carolinus, 378.
  erythrocephalus, 378.
Melanetta, 390.
  velvetina, 390.
Melaniella, 316, 318.
  gracillima,
MELEAGRINÆ, 382, 392, 393.
Meleagris, 382.
  gallopavo, 382.
Melospiza, 373.
  Lincolnii, 373.
  melodia, 373.
  palustris, 373.
Menephorus, 34, 50.
  dubius, 34.
Menippe *nodifrons*, 106.
  Rumphii, 106.
Mentiperca, 33, 34, 54.
  luciopercana, 34.
Mergus, 390.
  cucullatus, 390.
  merganser, 390.
  serrator, 390.
Mesembrinus, 316.
Mesodesma, 197.
Mesodon, 304, 362.
Mesoprion, 59, 63.
  Caxis, 63.
  chrysurus, 60.
  cynodon, 75, 77, 78.
  grisseus, 75.
  Lutjanus, 62.
  vorax, 66.
Metograpsus *dubius*, 113.
  gracilis, 113.
Mica, 326.
Micropalama, 383.
  himantopus, 383.
Micropanope caribbæa, 106.
  cristimana, 107.
  latimana, 107.
Microphysa, 81, 221, 316.
  Boothiana, 317.
  vortex, 317.
Milvulus *tyrannus*, 394.
  forficatus, 394.
MIMINÆ, 365.
Mimus, 365.
  longicaudatus, 138.
  nigriloris, 137.
  polyglottus, 2, 365.
  theuca, 138.
Mniotilta, 367.
  varia, 367.
MNIOTILTEÆ, 367.
MNIOTILTIDÆ, 367, 392, 393.
Molgula *Manhattensis*, 83, 86, 87, 91.
Molothrus, 374.
  pecoris, 144, 156, 157, 374.
Monrolite, 326.
MOTACILLIDÆ, 367, 392.
MURÆNIDÆ, 30.
Muscovite, 326, 329.
Mychostoma, 24.
Myelois albiplagiatella, 269.

Myelois *convolutella*, 269.
grossulariæ, 269.
Myiarchus, 375.
crinitus, 375.
Myiodioctus, 369.
Canadensis, 369.
mitratus, 369.
pusillus, 369.
MYXINIDÆ, 80.

Nandopsis *tetracanthus*, 80.
Nanina, 169, 170, 210.
cabias, 169.
Chamissoi, 338, 351.
Nauclerus, 380.
forficatus, 380.
Nectocrangon *lar*, 125.
NEMATOGNATHI, 80.
Neocoryx *Spraguei*, 398.
Nephopteryx latifasciatella, 269.
Edmandsii, 270.
roseatella, 270.
Neritura, 349.
Nettion, 389.
Newcombia, 333, 334. 335, 336.
picta, 336, 351.
Nisus, 380.
Cooperi, 380.
fuscus, 380.
palumbarius, 380.
Nomophila *noctuella*, 258, 260.
Notolopas, 96.
lamellatus, 97.
Numenius, 385.
borealis, 385.
Hudsonicus, 385.
longirostris, 385.
Nyctale, 378.
acadica, 378.
Richardsonii, 398.
Nyctea, 379.
Nyctiardea, 386.
grisea, 386.
Nyctherodias, 386.
violaceus, 386.

Ocyurus, 59, 60.
ambiguus, 59.
aurovittatus, 59.
chrysurus, 59.
lutjanoides, 59.
OCYPODOIDEA, 113.
ODONTOGNATHA, 253.
Œdemia, 390.
nigra, 390.
OLEACINIDÆ, 160.
Oleacina, 317.
solidula, 318. 347.
?Oligoclase-felsite, 328.
Omalonyx, 198, 199, 202, 203, 205, 224, 343, 344.
appendiculata, 199.
depressa, 199.
felina, 204, 346.
pardalina, 204.
unguis, 198, 199, 200, 201, 202, 203, 204, 206, 209, 344.
Onchidella, 341.
Onchidium, 159, 339, 340, 351.
Schrammi, 339.
Opeas, 316.
octonoides, 317.
subula, 317.
OPHIDIDI, 80.
Oporornis, 369.
Oreophorus, 117.
nodosus, 119.
ORTHALICEA, 119.
ORTHALICINÆ, 160, 163, 166, 168, 307.
Orthalicus, 80, 163, 168, 254, 255, 317, [illegible].
undatus, 254, 318.
zebra, 254.
ORTYGINÆ, 382.
Ortyx, 382.
Virginianus, 382.
Osachila acuta, 114.
tuberosa, 114.
Otina, 349.
Otus, 378.
brachyotus, 378.
vulgaris, 378.
Oxyechus, 383.

Pachygrapsus *gracilis*, 113.
innotatus, 114.
socius, 114.
transversus, 113.
Pagellus, 172.
calamus, 173, 178.
caninus, 176.
humilis, 182.
microps, 182.
orbitarius, 179.
penna, 176.
Pagrina, 170, 171.
Pagrus, 172.
Palæmonetes, 128.
carolinus, 129.
exilipes, 130.
vulgaris, 129.
Palæmonopsis, 128.
carolinus, 129.
exilipes, 130.
vulgaris, 129.
Pallifera, 300.
Pandalus, *annulicornis*, 128.
borealis, 128.
Gurneyi, 128.
Pandion, 380.
haliætus, 380.
Panopeus planissimus, 108.
Paranthias, 46.
PARIDÆ, 366, 392, 398.
PARINÆ, 366.
Parmacella, 253.
palliolum, 253.
Parthenope, 98.
Partula, 334.
Partulina, 332, 333, 334. 335.
bulimoides. 335, 336.
eburnea, 331, 332, 336, 337.
pallida, 336, 337.
plumbea, 331, 332.
tæniolata, 336, 337.
Parula, 368.
Americana, 368.
insularis, 4.
pitiayumi, 5.
Parus, 366.
atricapillus, 366.
Carolinensis, 366.
Passerculus, 372.
savanna, 372.
Passerella, 373.
iliaca, 373.
PASSERES, 365.
Patula, 163, 167.
alternata, 167.
asteriscus, 167.
PEDICULATI, 80.
Pediocaëtes, 382.
phasianellus, 382.
PELECANIDÆ, 390, 392.

Pelecanus, 390.
  erythrorhynchus, 390.
Pelecychilus, 222.
Pelidna, 384.
Pellicula, 206, 207, 209, 348.
  convexa, Mart., 203, 205, 207, 211, 344.
  depressa, 204, 205, 207, 210, 344.
Pempelia fenestrella, 259, 260.
  fusca, 271.
  grossulariæ, 269.
  leoninella, 259.
  ovalis, 269.
  palumbella, 259.
Penæus *brasiliensis*, 132, 134.
  caramote, 133.
  carinatus, 135.
  constrictus, 135.
  fluviatalis, 133.
  pubescens, 133.
  semisulcatus, 135.
  setiferus, 133, 134, 135.
Penninite, 327.
Pentaceros, 32.
Perca *aberrans*, 73.
  atraria, 52.
  guttata, 48.
  punctulata, 50.
PERCIDÆ, 30, 31, 35, 48, 55, 61, 73, 74.
PERCINÆ, 72, 73.
PERDICIDÆ. 382, 392, 393.
Perisoreus *Canadensis*, 393.
Perissoglossa *carbonata*, 394.
Peronia, 341.
Petenia, 162.
Petrochelidon, 370.
  lunifrons, 370.
Petrolisthes erismerus, 119.
  rupicola, 119.
PETROMYZONTIDI, 30.
Peucæa, 373.
  æstivalis, 373.
  Cassinii, 394.
PHALAROPODIDÆ, 385, 392, 393.
Phalaropus, 385.
Phallusia *mammillata*, 88.
PHARYNGOGNATHI, 30.
PHASIANIDÆ, 382.
Philohela, 383.
  minor, 383.
Phonipara fumosa, 396.
PHYCIDÆ, 267.
PHYLLOVORA, 159, 160.
Physa, 255.
  ampullacea, 256.
  striata, 256.
Pica, 375.
  caudata, 375.
PICARIÆ, 376.
PICIDÆ, 377, 392, 393.
PICINÆ, 377.
Picoides, 377.
  arcticus, 377.
Picus, 377.
  pubescens, 377.
  villosus, 377.
Pilumnus *ceratopus*, 109.
  depressus, 109.
  marginatus, 109.
  Xantusii, 109.
Pimelepterina, 171.
Pineria, 22, 23, 168.
  Beathiana, 22.
  Schrammi, 23, 80.
  terebra, 22, 23.
  Viequensis, 22, 23, 25, 26.
Pinicola, 371.
  enucleator, 371.
Pinnixa *chætopterana*, 120.
Pipilo, 374.
  arcticus, 8.
  carmani, 7.
  erythrophthalmus, 7, 374.
Pisidium, 196.
Plagioptycha, 316, 318.
  Albersiana, 317, 318.
  disculus, 317, 318.
PLAGIOSTOMI, 30.
Planesticus, 365.
Planorbis, 256.
Platyinius, 59, 66, 70.
  vorax, 59.
PLECTOGNATHI, Cuv., 30.
Plectrophanes, 372.
  Lapponicus, 372.
  Maccowni, 393.
  nivalis, 372.
  ornatus, 393.
  pictus, 372.
Plectropoma *chloropterum*, 45, 57.
  hispanum, 57.
  nigro-rubrum, 45, 57.
  puella, 55.
  serratum, 45, 57.
  Susuki, 57.
Plectropomus, 44.
Plethodon *erythronotus*, 150.
PLEURONECTIDI, 30.
PLEUROTREMI, 30.
PLOTEIDÆ, 391, 392, 393.
Plotus, 391.
  anhinga, 391.
Podiceps, 392.
  auritus, 392.
  cristatus, 392.
  griseigena, 392.
PODICIPIDÆ, 392, 393.
Podilymbus, 392.
  podiceps, 392.
Padonema vestita, 97.
Pogonoperca, 33.
Polioptila, 366.
  cærulea, 366.
POLIOPTILINÆ, 366.
Polygyra, 316, 318.
  microdonta, 317.
Polymita, 318, 341, 342.
  varians. 317.
Polyonyx *macrocheles*, 120.
POMACENTRIDI, 30.
Pompholyx, 350.
Poocaëtes, 372.
  gramineus, 372.
Porcellana *machrocheles*, 120.
PORCELLANOIDEA, 119.
Porphyrio, 387.
Potassium, 326, 328, 329, 330.
Porzana, 387.
  Carolina, 387.
  Jamaicensis, 387.
  Noveboracensis, 387.
Pretometopon, 34, 39, 43.
  apiarius, 34.
  guttatus, 34.
Prionodes. 33.
Progne, 370.
  subis, 370.
Promicrops, 34, 42.
  Guasa, 34, 43.
Prophysaon, 293, 296.
  Hemphilli, 295, 297, 310.
Prospinus, 34, 44, 45, 46.

Prospinus *chloropterus*, 34, 39.
Protonotaria, 367.
  citrea, 367.
PROTOPTERI, 30.
Psammobia, 197.
Pseudocarcinus *Rumphii*, 106.
PSITTACI, 378.
PSITTACIDÆ, 378, 392, 393.
PTEROPHORIDÆ, 258, 265.
Pterophorus cervinidactylus, 266.
  cinereidactylus, 266.
  osteodactylus, 266.
  pergracilidactylus, 265.
  pterodactylus, 266, 267.
  sulphureodactylus, 266.
Pugettia, 96.
PULMONATA, 337.
Punctum, 163, 168, 307, 308.
  minutissimum, 306, 307.
  pygmæum, 308.
Pupa, 163, 220, 317, 350.
  fallax, 348.
  palanga, 222.
  sulcata, 222.
PUPINÆ, 162.
PYGOPODES, 392.
PYRALIDÆ, 257, 267, 270.
Pyralis *farinalis*, 265.
Pyranga, 371.
  æstiva, 371.
  rubra, 371.

Querquedula, 389.
  cyanoptera, 394.
QUISCALINÆ, 375.
Quiscalus, 375.
  versicolor, 144, 155, 156, 157, 375.

RAJIDÆ, 30.
RALLIDÆ, 387, 392, 393.
RALLINÆ, 387.
Rallus, 387.
  crassirostris, 19, 20.
  crepitans, 19, 20.
  elegans, 20, 387.
  longirostris, 19.
  Virginianus, 387.
RAPTORES, 378.
Recurvirostra, 385.
  Americana, 385.
RECURVIROSTRIDÆ, 385, 392.
REGULINÆ, 366.
Regulus, 366.
  calendula, 366.
  satrapa, 366.
Remipes *barbadensis*, 120.
Rhea *Darwinii*, 145.
Rhinogryphus, 381.
  aura, 381.
Rhodia, 93.
  pyriformis, 93.
Rhodonyx, 345.
Rhomboplites, 59, 61.
  elegans, 59, 62.
Rhyacophilus, 384.
Rhynchocylus parvulus, 124.
Rhypticus, 32.
Ripidolite, 327, 328.
Rissa *trydactyla*, 393.

Sagda, 219.
  connectens, 219.
  Haldemaniana, 219.
  Jayana, 219.
Salamandra *maculosa*, 150, 151.
Sanguinolaria, 197.
Sargina, 170.
SARGINI, 171.
Sayornis, 376.
  fuscus, 376.
  Sayus, 394.
SAXICOLIDÆ, 365, 392, 393.
Scapolite, 329.
SCARIDI. 30.
Schasicheila, 187, 316.
  Bahamensis, 316.
  minuscula, 316.
Schistorus, 34, 43, 45.
  mystacinus, 34, 43.
SCLERODERMI, 30.
Scolecophagus, 375.
  cyanocephalus, 375.
  ferrugineus, 375.
SCOLOPACIDÆ, 383, 392, 393.
SCOMBRESOCIDI, 30.
Scops, 379.
  asio, 379.
Scoparia *albisinuatella*, 171.
  centuriella, 271.
Scopula, 267.
  glacialis, 271.
  inquinatalis, 260.
  occidentalis, 260.
Scotiaptex, 379.
Scrobicularia, 197.
Scyllarus *nodifer*, 123.
Seiurus, 369.
  agilis, 369.
  aurocapillus, 369.
  formosus, 369.
  Ludovicianus, 369.
  Noveboracensis, 369.
  Philadelphia, 369.
  trichas, 369.
SERRANINÆ, 35, 38, 40, 46, 48, 50.
SERRANINI, 33, 34, 53, 55.
Serranus, 35, 38.
  bivittatus, 52.
  cardinalis, 35.
  coronatus, 48.
  creolus, 46.
  fascicularis, 54.
  gigas, 39.
  Guasa, 42.
  inermis, 40.
  luciopercanus, 54.
  mystacinus, 43.
  occulatus, 68.
  Ouatalibi, 50.
  Phæbe, 52.
Serpophaga *cinerea*, 139, 140.
  grisea, 139.
SETOPHAGÆ, 369.
Setophaga, 369.
  ruticilla, 369.
Sialia, 365.
  sialis, 144, 155, 156, 157.
Sicyonia *brevirostris*, 132.
  carinata, 132.
  cristata, 132.
  laevigata, 131.
Sigillaria, 275.
Sillimanite, 326.
SILURIDI, 30.
Simpulopsis, 198, 199, 200, 201, 206, 210.
  Chiapensis, 200.
  Cordovana, 200.
  corrugatus, 200.
  Portoricensis, 343.
  Salleana, 200.
  sulculosa, 199, 206, 210, 343.

Sitta, 366.
Carolinensis, 366.
Canadensis, 366.
pusilla, 394.
SITTINÆ, 366.
Sodium, 325, 330.
Solenolambrus arcuatus, 101.
typicus, 101, 102.
Somateria *spectabilis*, 393.
SPARIDI, 170, 171.
SPARINI, 171.
SPAROIDÆ, 59.
Sparus, 170, 172, 175.
aurata, 172.
Bajonado, 176, 178.
calamus, 178.
orbitarius, 179.
Spatula, 389.
Spelæophorus *nodosus*, 119.
Speotyto *hypogæa*, 394.
Sphærodon, 172.
SPHYRÆNIDÆ, 30.
Sphyropicus, 377.
varius, 377.
Spizella, 373.
monticola, 373.
pallida, 373.
pusilla, 373.
socialis, 144, 151, 153, 154. 156, 373.
SPIZINÆ, 373.
SQUALIDI, 30.
Squatarola, 383.
Squilla *barbadensis ovalis*, 120.
STEGANOPODES, 390.
Steganopus, 385.
Stelgidopteryx, 370.
serripennis, 370.
Stenogyra, 163, 169, 316, 317, 350.
decollata, 159.
Stenopteryx *hybridalis*, 260.
Stenotrema, 304.
Stenopus, 338.
Sterna, 391.
anglica, 391.
antillarum, 391.
caspia, 391.
fissipes, 392.
Forsteri, 391.
hirundo, 391.
macroura, 393.
paradisea, 393.
regia, 391.
STERNINÆ, 391.
Strepsilas, 383.
interpres, 383.
STRIGIDÆ, 378, 392, 393.
STRIGINÆ, 378.
Strix, 378.
flammea, 378.
Strophia, 317, 318, 322.
Cumingiana, 318.
cyclostoma, 318.
decumana, 348.
incana, 318.
iostoma, 318.
marmorata, 318.
microstoma, 322.
mumia, 318, 348.
striatella, 322.
Sturnella, 374.
magna, 374.
neglecta, 374.
Stylodon, 169.
SUBACANTHOPTERI, 30.
Subulina, 316.
octona, 317.
Succinea, 163, 198, 199, 201, 202, 224, 317, 343, 345.
appendiculata, 198, 199, 204, 205, 206, 209, 210, 225, 254, 343.
canella, 338.
depressa, 204, 205, 206, 207, 343.
luteola, 318.
ovalis, 200.
patula, 223.
rupicola, 346.
tigrina, 202.
tumida, 346.
SUCCININÆ, 163, 169, 198, 199. 200, 201, 205, 223, 224.
Surnia, 379.
ulula, 379.
SYLVIIDÆ, 366, 392, 393.
SYMPHARYNGODONTES, 30.
Symphemia, 384.
semipalmata, 384.
Synallaxis *guianensis*, 186.
maculata, 186.
Syndesmya, 197.
Syrnium, 379.
cinereum, 379.
nebulosum, 379.

Tachycineta, 370.
bicolor, 370.
Tachytriorchis, 381.
TANAGRIDÆ, 371, 392, 393.
Tantalus, 385.
loculator, 385.
Tebennophorus, 255, 300.
TELEOCEPHALI, 30, 31.
TELEOSTEI, 30.
Tellina, 197.
TELLINIDÆ, 197.
Telmatodytes, 367.
TETRAONIDÆ, 382, 392, 393.
Thalasseus, 391.
THALASSINOIDEA, 120.
Thanmasia, 24, 27.
Thelidomus, 316, 318, 341.
provisoria, 317.
Thripadectes virgaticeps, 398.
flammulatus, 398.
Thryomanes, 367.
Thryothorus, 366.
Bewickii, 367.
Ludovicianus, 366.
Tinnunculus, 379.
Todirostrum superciliaris, 9.
schistaceiceps, 10.
Totanus, 384.
chloropus, 384.
flavipes, 384.
melanoleucus, 384.
Trachelia, 24.
Tringa, 384.
alpina, 384.
Bairdii, 384.
Bonapartei, 384.
canuta, 384.
maculata, 384.
maritima, 384.
minutilla, 384.
Tringoides, 384.
hypoleucus, 384.
macularius, 144, 155, 156.
Trisotropis, 34, 35, 39, 42, 50.
Aguaji, 34.
Bonaci, 34.
brunneus, 34.
calliurus, 34.
camelopardalis, 34.

Trisotropis *Cardinalis*, 34.
chlorostomus, 34.
dimidiatus, 34.
falcatus, 34, 36, 51.
guttatus, 34.
interstitialis, 34.
petrosus, 34.
tigris, 34.
Trochatella, 316.
rupestris, 316.
Trochilus, 377.
colubris, 377.
TROCHILIDÆ, 377, 392, 393.
TROCHOLINÆ, 377.
Troglodytes, 367.
œdon, 367.
inquietus, 4.
insularis, 3.
parvulus, 367.
TROGLODYTIDÆ, 366, 392, 393.
Trogon eximius, 11.
venustus, 13.
viridis, 11, 12, 13.
Tropidinius, 59, 65.
Arnillo, 59, 65.
Tryngites, 385.
rufescens, 385.
TURDIDÆ, 365, 392, 393.
TURDINÆ, 365.
Turdus, 365.
Aliciæ, 365.
fuscescens, 144, 154, 155, 156, 157, 365.
migratorius, 155, 365.
mustellinus, 365.
naevius, 393.
Pallasii, 365.
Swainsoni, 365.
Tyche *lamellifrons*, 97.
TYRANNIDÆ, 375, 392, 393.
TYRANNINÆ, 375.
Tyrannus, 375.
Carolinensis, 144, 155, 156, 157, [375.
verticalis, 394.

Uhlias, 117.
ellipticus, 117, 118.
limbatus, 118.
Ungulina, 196.
UNGULINIDÆ, 196.

Velorita, 196.
Verilus, 59, 70.
sordidus, 59, 70.
Vermiculite, 327.
VERMIVORA, 159, 160.
VERMIVORÆ, 367.
Veronicella, 159, 300, 340.
occidentalis, 339.
Vertigo, 163.
Virbius *acuminatus*, 127.
pleuracanthus, 127.
Vireo, 370.
agilis, 21.
Belli, 370.
calidris, 21.
flavifrons, 370.
gilvus, 370.
Noveboracensis, 370.
olivaceus, 21, 370.
Philadelphicus, 370.
solitaria, 370.
VIREONIDÆ, 370, 392, 393.
Vireosylvia, 370.
magister, 20.
Vitrina, 159, 163, 252, 253, 340.
limpida, 159.
Sumichrasti, 200.
VITRINEA, 169, 220, 221.
VITRININÆ, 163, 167, 170, 340.
Vitrinoconus, 338.

Wernerite, 329.
Wollastonite, 327.
Wörthite, 326.

Xantho *planissima*, 103.
vermiculata, 104.
Xanthocephalus, 374.
icterocephalus, 374.
Xanthodes insculpta, 105.
granosimanus, 105.
Xantusii, 105.
Xanthonyx, 200, 201, 210, 224.
Cordovanus, 201.
Salleanus, 201.
Sumichrasti, 200, 201.
Xema *Sabinei*, 393.
Xenolite, 326.

Zenaidura, 382.
Carolinensis, 18, 382.
graysoni, 17, 18.
Yucatanensis, 18.
Zonites, 159, 163, 164, 165, 220, 252, 253, 391, 302, 316, 317, 340.
cellarius, 159.
chersinus, 159.
demissus, 165.
Elliotti, 165.
fulvus, 338.
gularis, 164.
Gundlachi, 338.
kopnodes, 164.
nitidus, 165.
sculptilis, 164.

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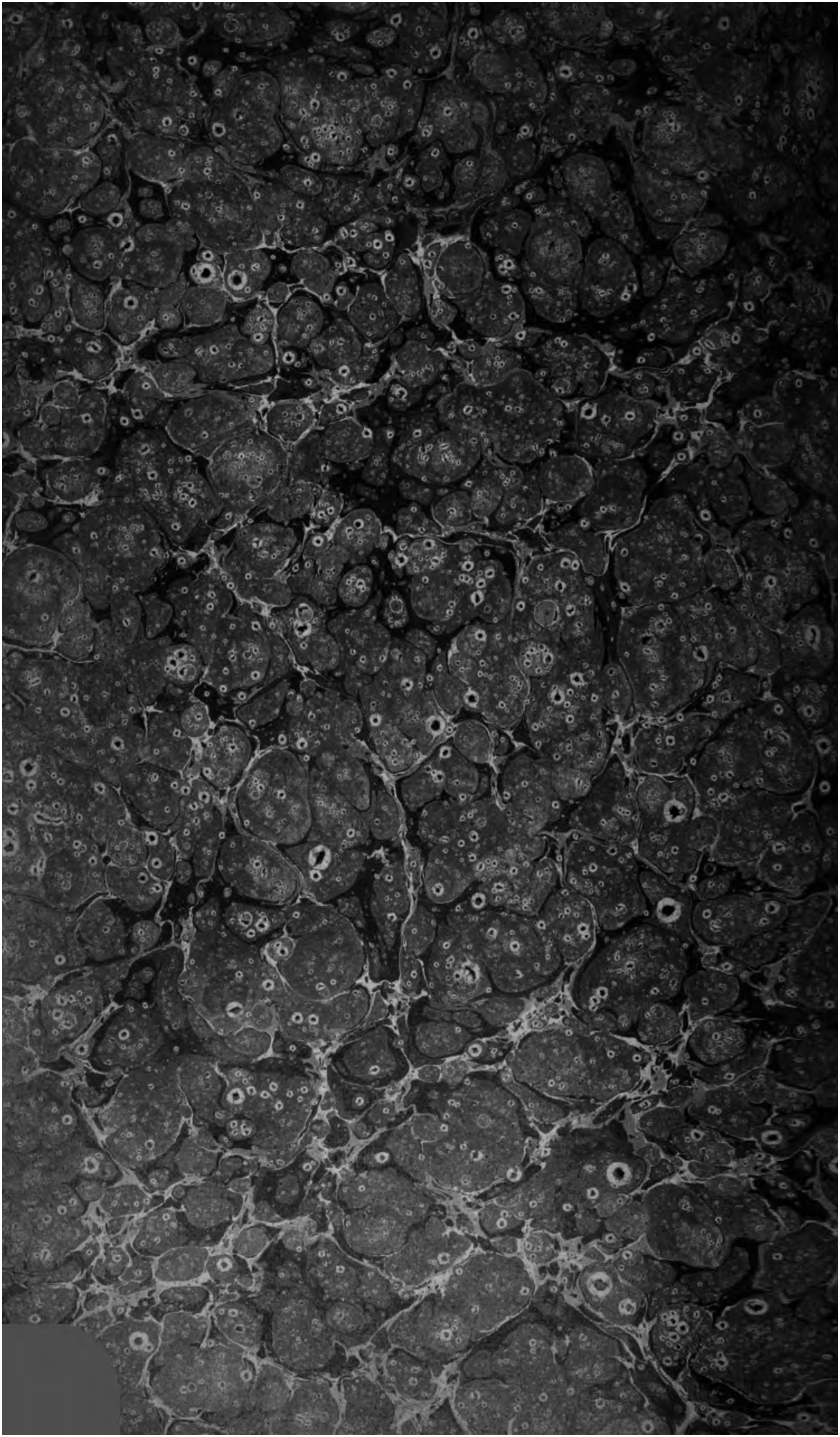
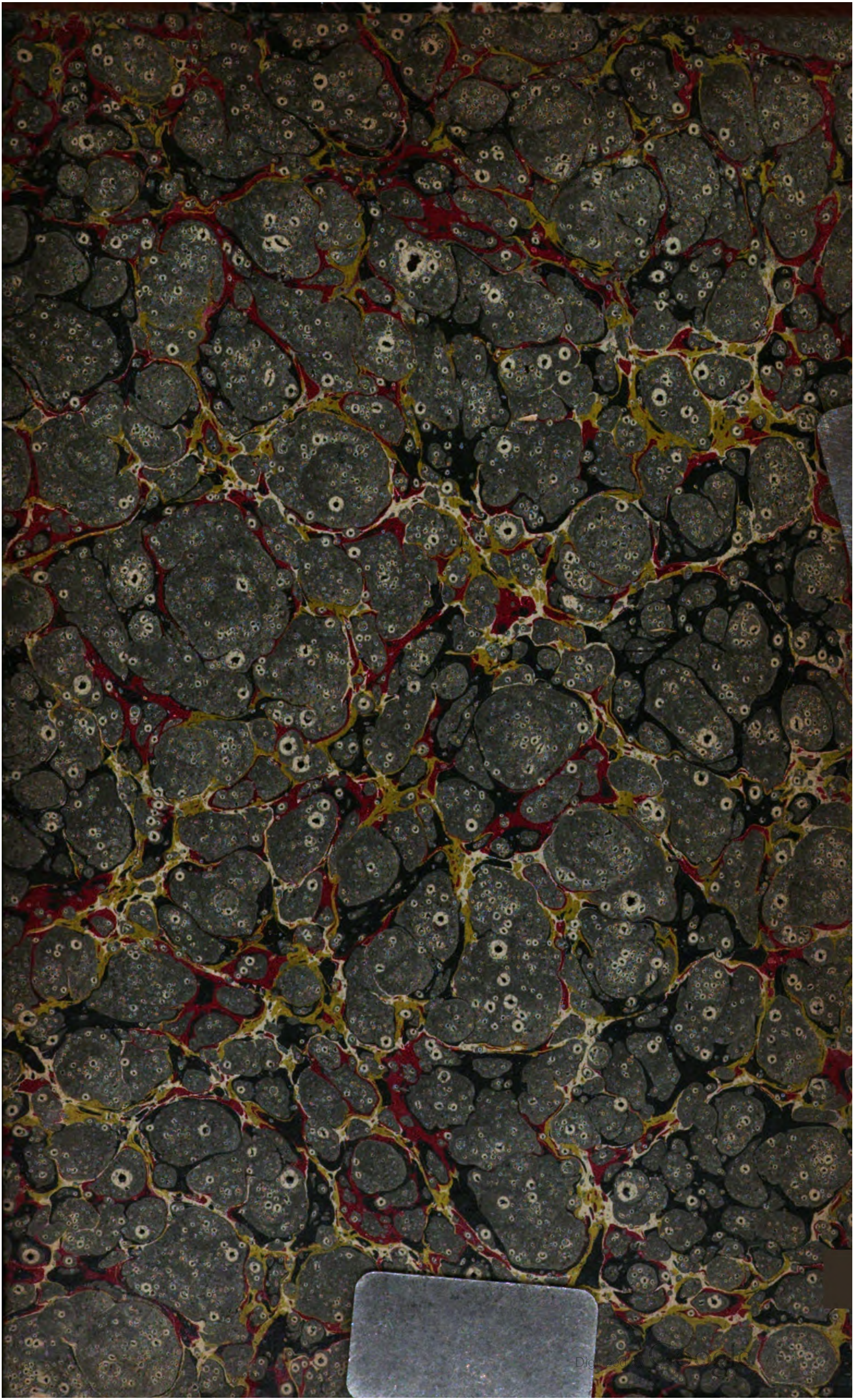
CONTENTS.

Title, List of Plates and Contents, Volume X.

Errata, ... xi
Index to Volume X, ... 401





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